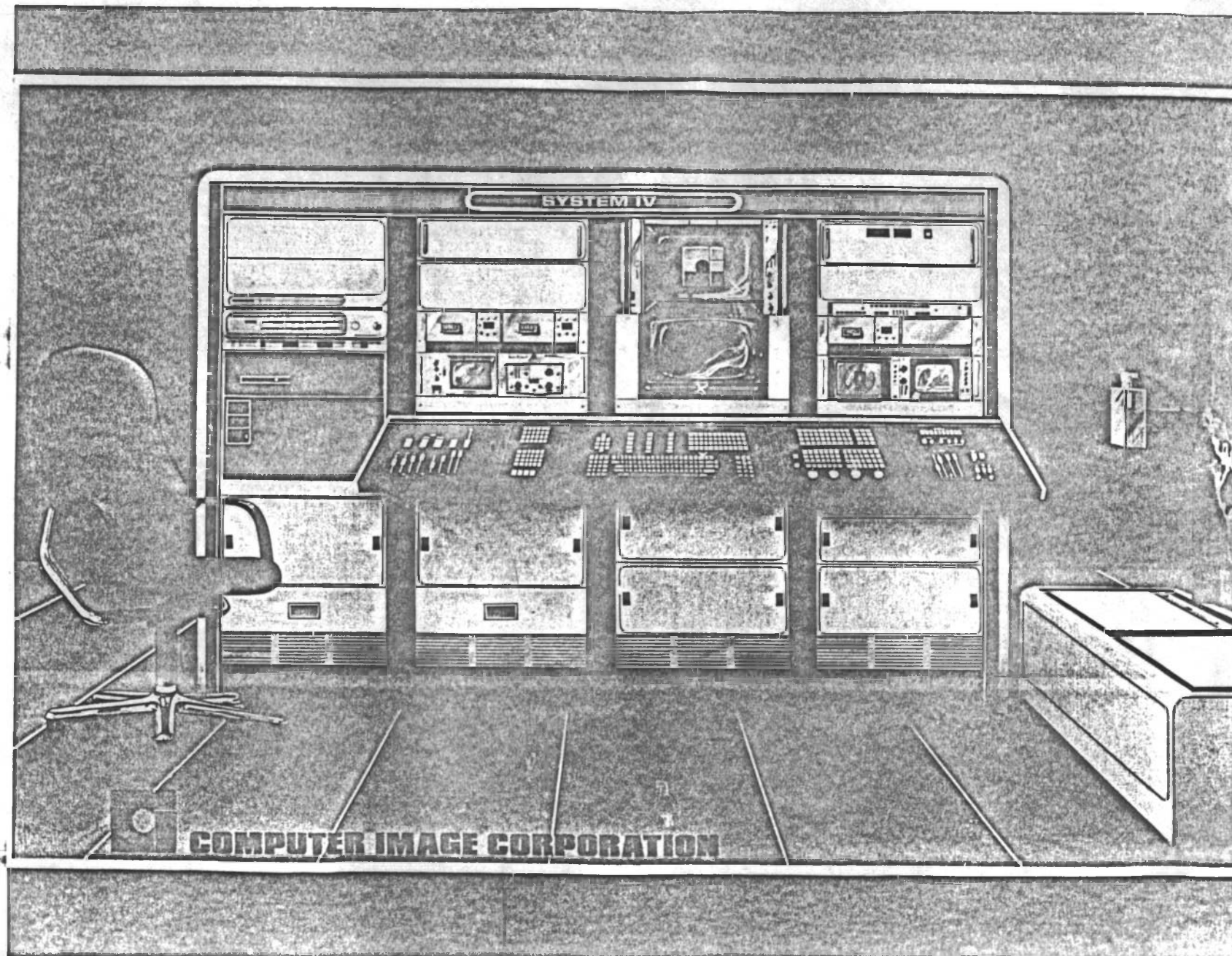
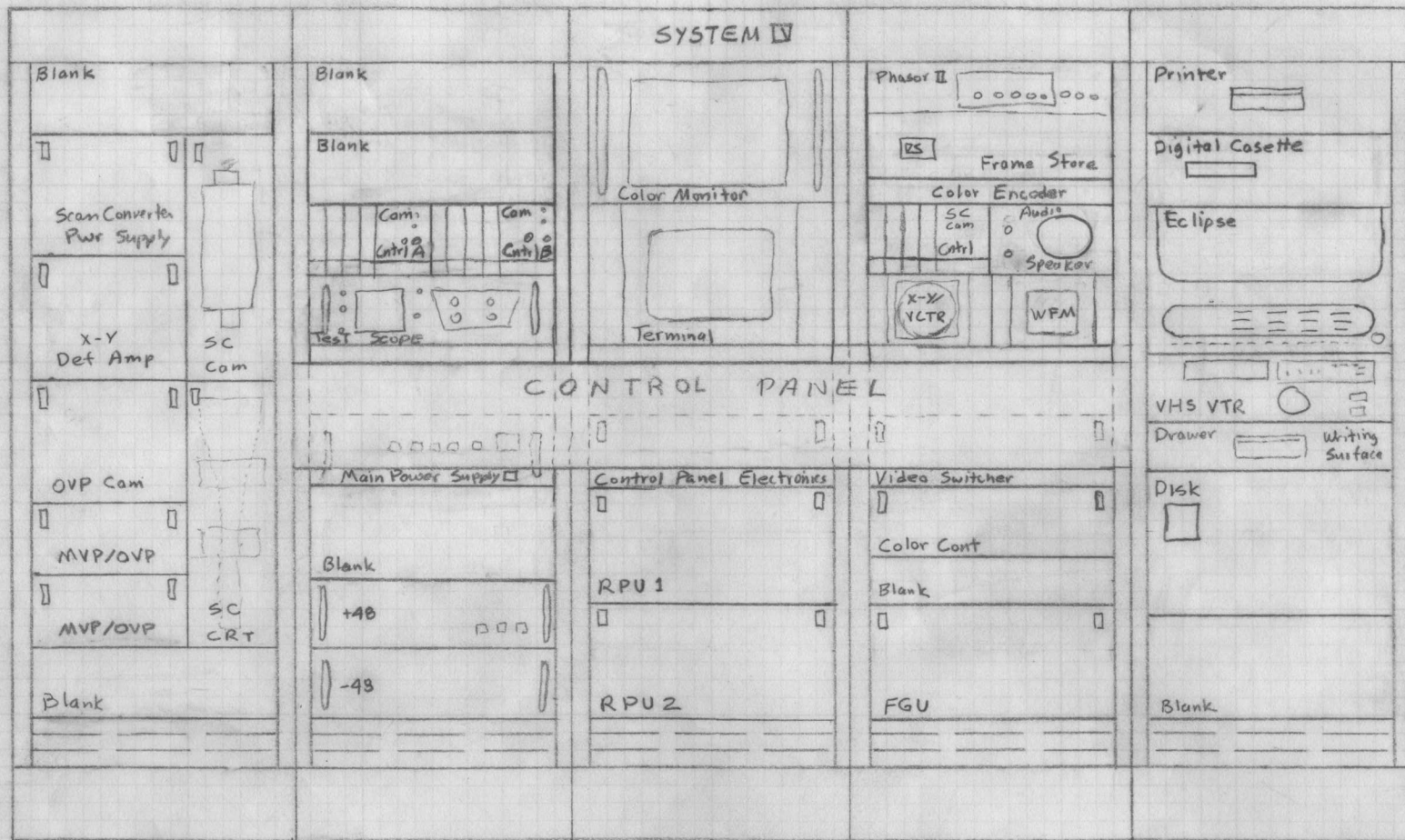




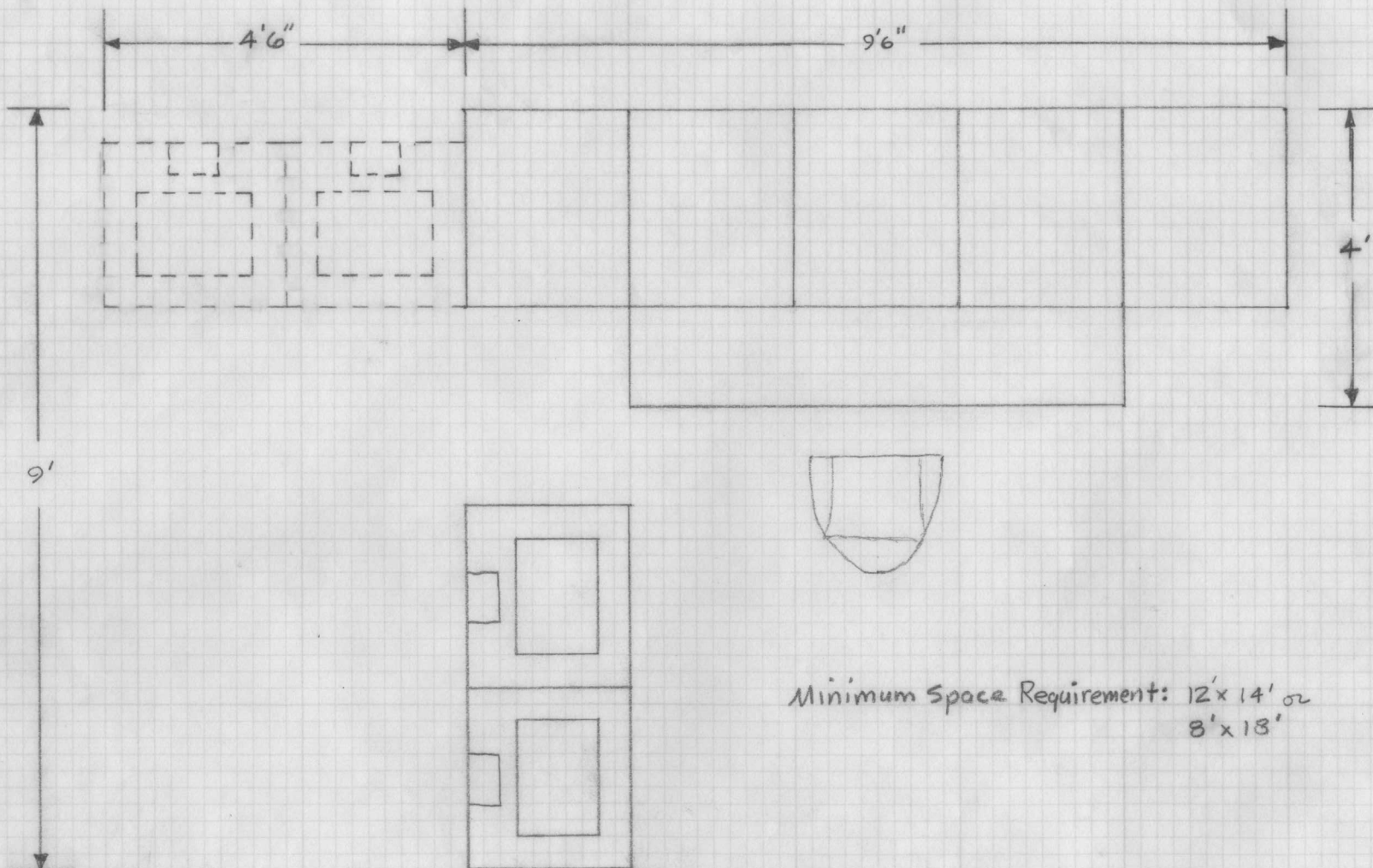
 **COMPUTER IMAGE CORPORATION**



SYSTEM IV, Compact Package

11/5/82  
3/24/83  
4/20/83





SYSTEM IV, Postproduction Center Package  
(Editel)

Computer Image

#### SYSTEM IV--Subsystem List

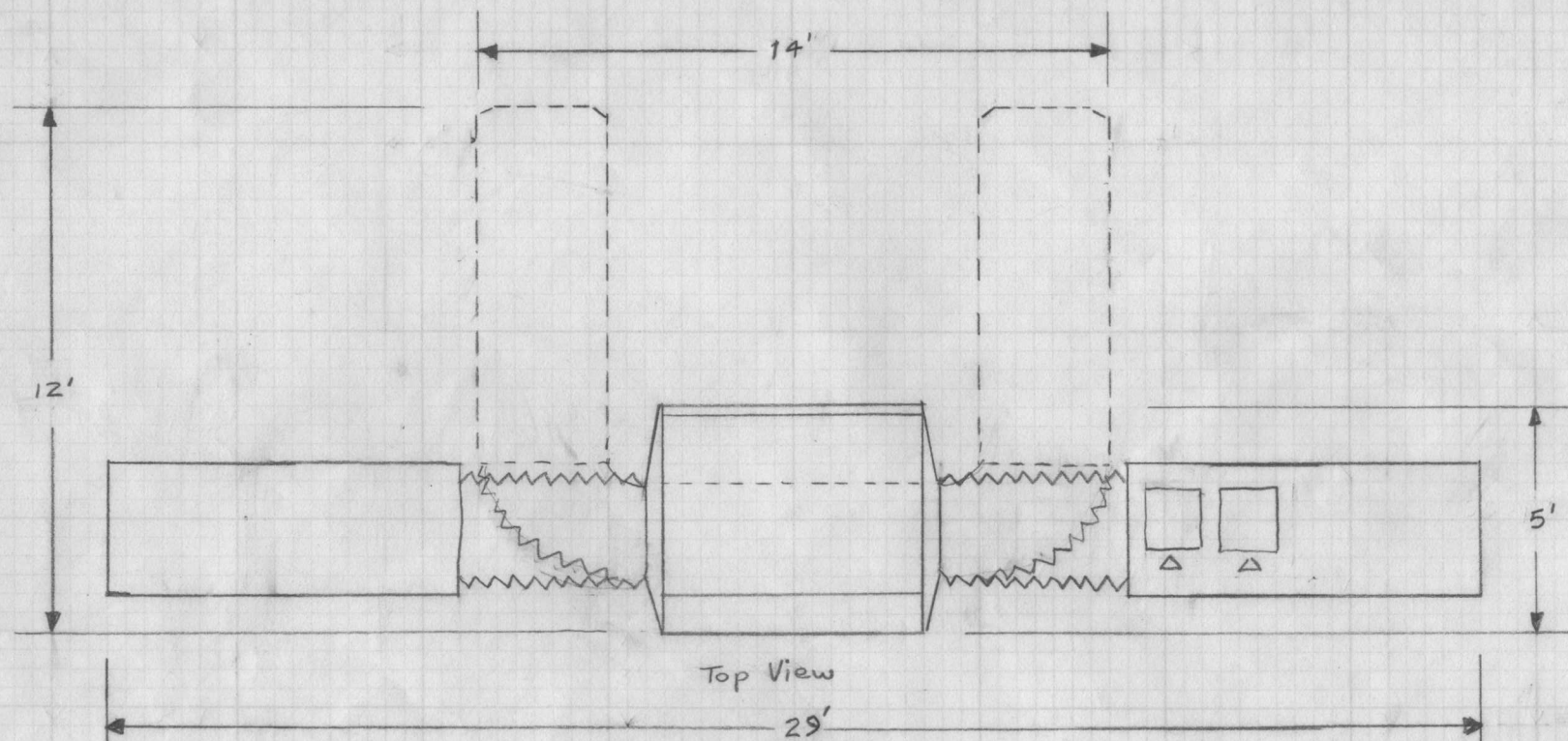
1. Printer, Epson #MX80
2. Computer, DG 4130 #8611-NB including other boards
3. Data Cassette, DEI #D6400C
4. Data Cassette Power Supply, MICRO Computer #CP-148
5. Disk, DG 25 M Byte #6102
6. Scan Converter Hi Resolution Monitor, CI
7. Scan Converter Camera mount with overlap including silicon target vidicon tube
8. Scan Converter Power Supply, CI
9. Input Camera A, Control and Head, COHU #s 7900 & 7120, including vidicon tube
10. Input Camera B, Control and Head, COHU #s 7900 & 7120, including vidicon tube
11. Test Oscilloscope, Tektronix #922R
12. Monitor Video Processor, CI
13. Color Monitor, Tectronix #650HR
14. Control Terminal, Dotronix #BDH1211
15. Control Panel Electronics, CI
16. Raster Processing Unit #1, RPU1, CI
17. Raster Processing Unit #2, RPU2, CI
18. Function Generator Unit, FGV, CI
19. Main Power Supply, CI
20. Color Encoder, Fernsh #TCE-2000N
21. Scan Converter Camera, Control and Head, COHU #s 7900 & 7120 including  
Leddicon tube
22. X-Y Monitor, Raster and Color Vestor, Teletronix #604 A
23. Waveform Monitor, Tektronix #528A
24. Video Switcher, CI
25. Color Controller, CI
26. Camera Stand A, Bencher Light Housing Assembly



SYSTEM IV SUBSYSTEM LIST CONTINUED

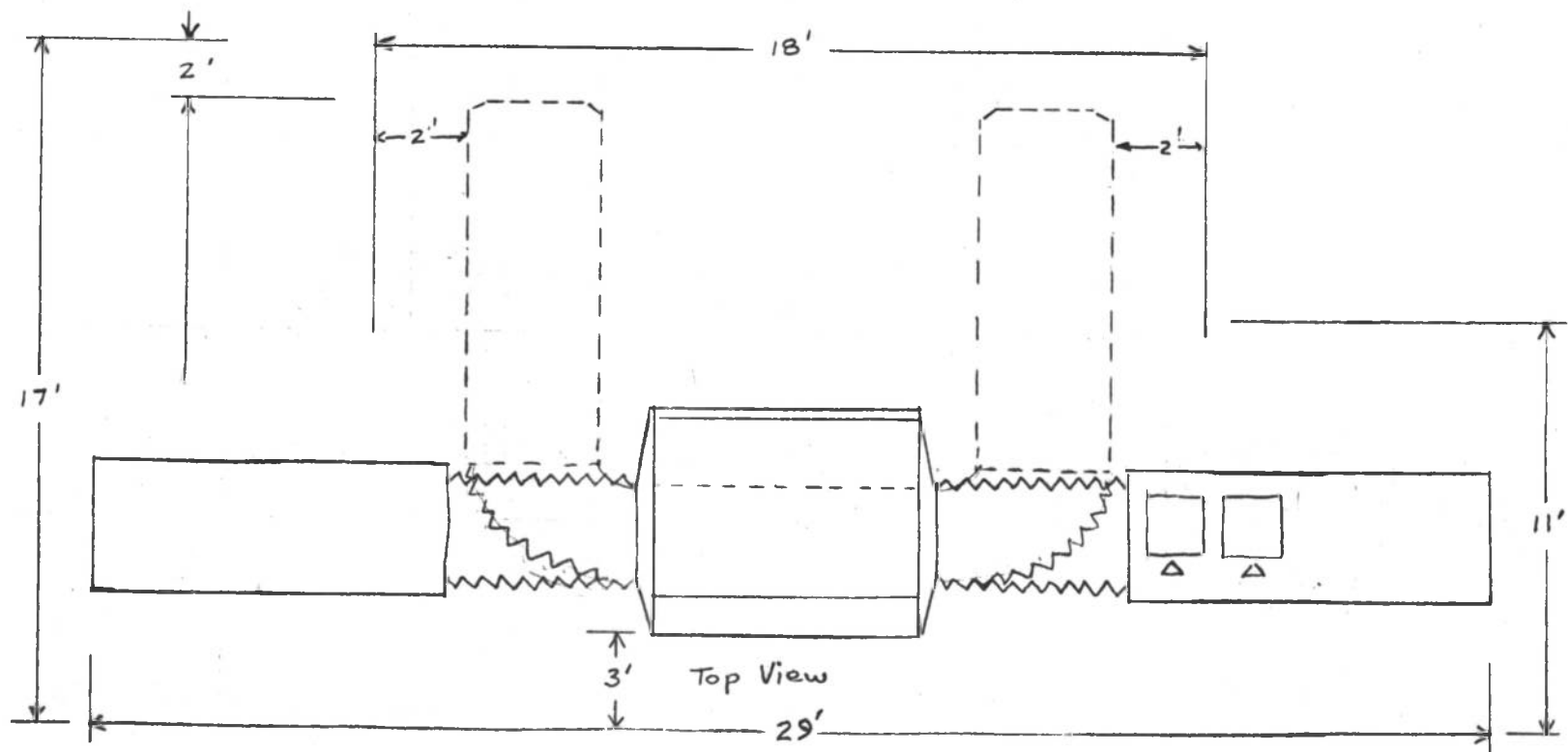
- 27. Camera Stand B, Bencher Light Housing Assembly
- 28. Control Panel, CI
- 29. Housing; Racks,
- 30. Cooling System
- 31. Cabling

Minimum Space Requirement: 17' x 18'



System IV Production Center Package  
(Radio Television Luxembourg)

Computer Image



SYSTEM IV

COMPUTER IMAGE

11/9/81



28

|                          |                            |
|--------------------------|----------------------------|
| 1                        | PRINTER<br>(INSIDE DRAWER) |
| 2                        | ECLIPSE<br>S130            |
| 3, 4                     | DATA CASSETTE              |
| 5                        | 6103 DISK                  |
| PULL OUT WRITING SURFACE |                            |
| 6                        | SC MONITOR                 |
| STORAGE DRAWER           |                            |
| BLOWER                   |                            |

|                |                         |
|----------------|-------------------------|
| 8              | + 48V SOLA              |
|                | - 48V SOLA              |
| 9              | CAM A      CAM B        |
| 10             | T922 TEST SCOPE         |
| BLANK          |                         |
| CONTROL PANEL  |                         |
| BLANK          |                         |
| 11             | MONITOR VIDEO PROCESSOR |
| BLANK          |                         |
| 7              | SC CAMERA               |
| STORAGE DRAWER |                         |
| BLOWER         |                         |

|               |                           |
|---------------|---------------------------|
| 12            | 650HR<br>COLOR<br>MONITOR |
| 13            | COMPUTER<br>CRT           |
| BLANK         |                           |
| CONTROL PANEL |                           |
| BLANK         |                           |
| 14            | CONTROL PANEL ELECTRON.   |
| 15            | RPU 1                     |
| 16            | RPU 2                     |
| BLOWER        |                           |

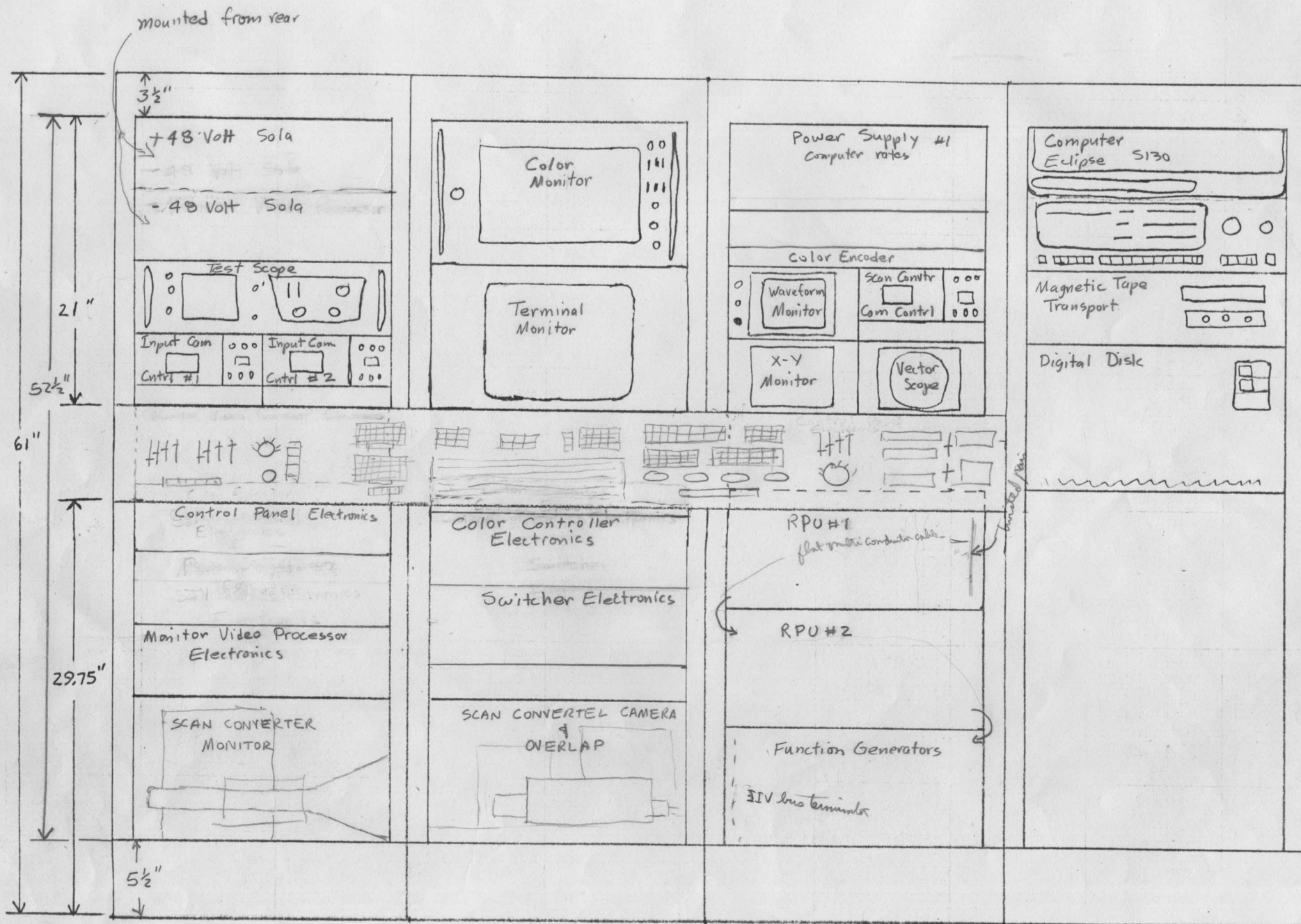
|                               |               |
|-------------------------------|---------------|
| 18 MAIN POWER SUPPLY          |               |
| BLANK                         |               |
| 19                            | COLOR ENCODER |
| 20<br>3C<br>CAMERA<br>CONTROL |               |
| 21<br>X-Y<br>MONITOR          | 22<br>WFM     |
| BLANK                         |               |
| CONTROL PANEL                 |               |
| BLANK                         |               |
| 23<br>VIDEO SWITCHER          |               |
| 24<br>COLOR CONTROLLER        |               |
| 17                            |               |
| FG NEST                       |               |
| BLOWER                        |               |

27

25, 26  
Camera Stand

SYSTEM 4 RACK VERSION

6/30/82 JA

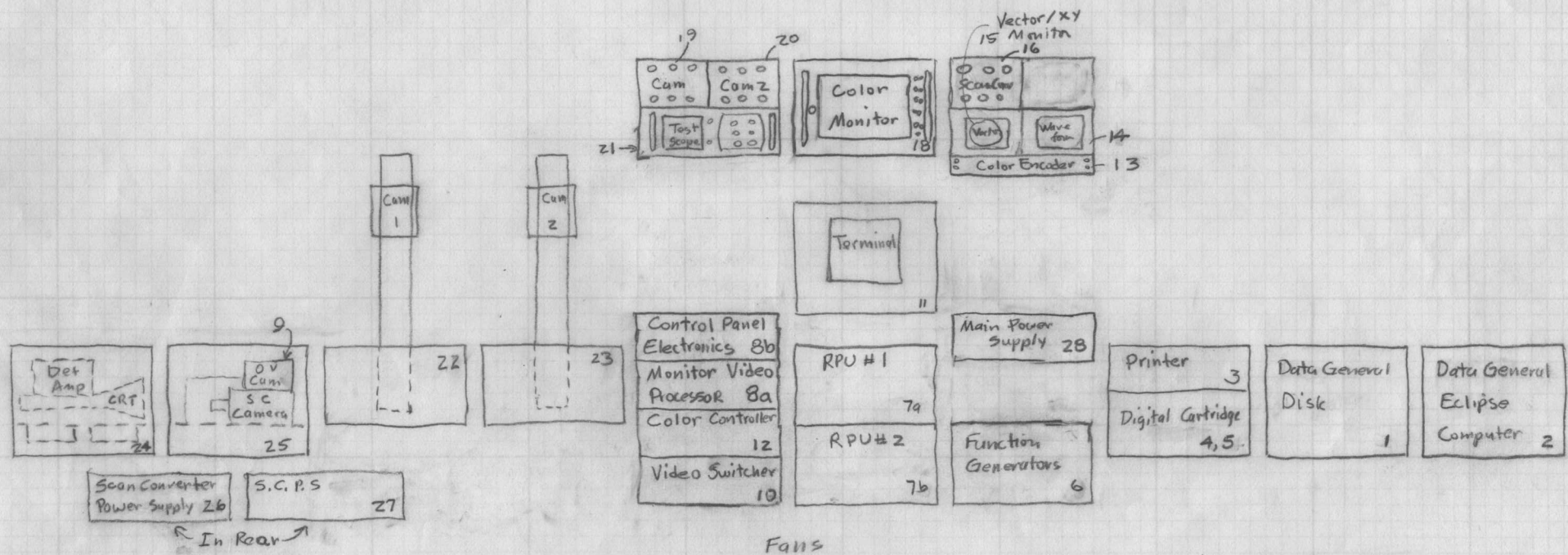


PROTOTYPE SYSTEM IV

24.5"

10/19/80





SYSTEM IV Systems Layout

1/11/82



## S IV Equipment list

4/21/80

9/18/80

10/3/80

11/20/80

1/11/82

1. Eclipse Disk , DG # 6093

10 $\frac{1}{2}$ " x 19" x 30"

2. Eclipse Computer, DG 5130

10 $\frac{1}{2}$ " x 19" x 25"

3. Printer, Epsom # MX80

10 $\frac{1}{2}$ " x 19" x 25"

4. Data Cartridge, Data Electronics # S-3

19" x 5 $\frac{1}{4}$ " x 9"

5. Data Cartridge Power Supply

Estimated 3"

6. Function Generator (Oscillators)

8 $\frac{3}{4}$ " x 19" x 15"

7a R. P. U. #1

8 $\frac{3}{4}$ " x 19" x 15"

7b. R. P. U. #2

8 $\frac{3}{4}$ " x 19" x 15"

8a. Monitor Video Processor

5 $\frac{1}{4}$ " x 19" x 10"

8b. Control Panel Electronics

5 $\frac{1}{4}$ " x 19" x 10"

9. Overlap Camera Control

Included in Scan Converter unit

10. Switcher Electronics, Controll by Image #3000

5 $\frac{1}{4}$ " x 19" x 10"

11. Digital Terminal, Fernseh # BHD-1200

(13 $\frac{1}{4}$ )  
14 $\frac{3}{4}$ " x 19" x 18"

12. Color Controller Electronics

5 $\frac{1}{4}$ " x 19" x 10" unit

13. Color Encoder, Jelenation # 3001

1 $\frac{3}{4}$ " x 19" x 15"

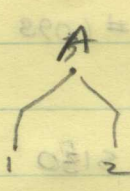
14. Waveform Monitor, Jek # 523

5 $\frac{1}{4}$ " x 9 $\frac{1}{2}$ " x 14"



2. Equipment List

4/2/80  
5/1/80  
10/3/80  
11/20/80  
11/1/80



1. 8.5" x 11" x 20" DC = 2000
2. 8.5" x 11" x 20" DC = 2000
3. Printer, Epson 4 x 80
4. Data Controller, Data Electronics
5. Data Controller, Power Supply
6. Function Generator (Oscillator)
7. R. P. U. #1
8. R. P. U. #2
9. Digital Video Processor
10. Control Panel Electronics
11. Imaging Camera Control
12. Switching Electronics
13. Digital Terminal, Form 4 800-1200
14. Color Controller Electronics
15. Color Encoder, 3001
16. Waveform Monitor, 400 # 558

1111111111  
1 2 3 4 5 6 7 8 9 10



15. Vector Monitor, Jek #604

$5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

16. Scan Converter Camera Control, Cohn #7900

$5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

17. X-Y Monitor, Jek #604

$5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

18. Color Monitor, Jek # 651HR

$10\frac{1}{4}" \times 19" \times 18"$

19. Input Camera #1 Control, Cohn #7900

$5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

20. Input Camera #2 Control, Cohn #7900

$5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

21. Test Oscilloscope, Jek # 922

$5\frac{1}{4}" \times 19" \times 19"$

22. Artwork Unit #1, Bencher lite box, controls, camera column, Cohn camera head

23. Artwork Unit #2, Bencher lite box, controls, camera column, Cohn camera head

24. Scan Converter #1, Monitor & Def Amp

$10\frac{1}{2}" \times 19" \times 25"$

2 x  $10\frac{1}{2}" \times 19" \times 25"$

25. Scan Converter #2, SC camera & OVLp Camera

$10\frac{1}{2}" \times 19" \times 25"$

26. +48 volt Supply, Sola with other UnReg Supply

$5\frac{1}{4}" \times 19" \times 13"$

27. +48 volt Supply, Sola

$5\frac{1}{4}" \times 19" \times 9\frac{3}{4}"$

28. Power Supply Unit #1, Computer rates

$5\frac{1}{4}" \times 19" \times 25"$

29. Power supply Unit #2, Computer rates

$5\frac{1}{4}" \times 19" \times 9\frac{3}{4}"$

30. Control Panel

31. Package Transformers for Lite Boxes



## Boards required per SYSTEM IV, pc or ww

5/11/81

### Subsystem 2. Eclipse Computer

- |   |                                                                                                                                        |  |
|---|----------------------------------------------------------------------------------------------------------------------------------------|--|
| 1 | A. MDB board 2 RS232 interfaces for the control panel electronics and the printer, purchased ready to go; MDB Systems Inc # MIOB-A-B-C |  |
| 1 | B. Intercon ww board on which are built interfaces for the magtape unit and the RPU; Intercon # NIOI-P ; CIC-W-60                      |  |
| 2 |                                                                                                                                        |  |

### SS 6. Function Generator

- |    |                                                         |          |
|----|---------------------------------------------------------|----------|
| 6  | A. 6 Function Generators built on large ww cards        | CIC-W-66 |
| 3  | B. 3 Function Generator Selects built on large ww cards | CIC-W-32 |
| 2  | C. 2 12-bit MDACs for amplitude control, CIC 1-1        |          |
| 1  | D. 1 Termination board built on large ww card           | CIC-W-33 |
| 1  | E. 1 Function Generator Combiner built on large ww card | CIC-W-67 |
| 1  | F. 1 Audio Filter                                       | CIC-W-43 |
| 14 |                                                         |          |

### SS 7a. RPU #1

- |    |                                                 |          |
|----|-------------------------------------------------|----------|
| 3  | A. 3 12-bit MDACs ; (2) CIC 1-2 and (1) CIC 1-4 |          |
| 2  | B. 2 8-bit DACs ; CIC-5                         |          |
| 1  | C. ECLIPSE INTERFACE                            | CIC-W-61 |
| 1  | D. PROCESSOR BOARD                              | CIC-W-62 |
| 1  | E. RAM BOARD                                    | CIC-W-63 |
| 1  | F. OUTPUT BOARD                                 | CIC-W-64 |
| 1  | G. DRIVER BOARD                                 | CIC-W-65 |
| 1  | H. Color Adder                                  | CIC-W-42 |
| 12 |                                                 |          |



SS7b. RPU #2

10

A. 10 12-bit MDACs; (6) CIC 1-1, (2) CIC 1-2, (1) CIC 1-3 (1) CIC 1-5

1

B. Intensity Compensation built on large ww card. CIC-W-20

1

C. Raster Generator built on large ww card. CIC-W-21

1

D. RPU Sync built on large ww card CIC-W-22

1

E. Horizontal Blanking built on large ww card CIC-W-23

1

F. Vertical Selective Blanking &amp; Function Decoder built on large ww card CIC-W-13

0  
15

[ G. RPU Exerciser built on large ww card CIC-W-68 ] not standard

SS8a. Monitor Video Processor

1

A. Monitor Pinionion correction; CVS-127A-2

1

B. Overlap Camera Yoke Compensation; CIC-W-24 built on small ww card

1

C. Monitor Yoke Compensation; CVS-123

2

D. (2) 4x1 Video Input Amplifier and Switch; CIC-7-1, CIC-7-4

1

E. Gray Level Multiplexer; CVS-114-2 built on small ww card

1

F. Monitor Video Processor Logic #1 built on small ww card CIC-14

1

F2. Monitor Video Processor Logic #2 built on small ww card CIC-15

1

G. Level Detectors; CVS-125-2

1

H. Gray Level Switches; CVS-111B-2

1

I. Video Amps; CVS-112

11

J. Overlay Video; built on small ww card

1

K. Overlay Intensity; SM-120

1

L. MVP Test Raster Generator; built on small ww card

12



(2)

- $$\begin{array}{r} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ \hline 5 \\ 1 \\ \hline 6 \\ 1 \\ \hline 7 \end{array}$$

$$\frac{1}{7}$$

- 1  
1  
1  
3  
2  
1  
1  
1  
1

- $$\frac{3}{14}$$



SS 24. Scan Converter #1, Monitor

- 2 A. (2) X-Y Deflection Amplifier; SM-122D  
1 B. Focus Coil Current Regulator, Blanking and Video Amp; SM-139A  
1 C. CRT Socket Circuit; SM-143A  
1 D.  $\pm 36$  Volt Regulator; SM-111A  
 $\frac{1}{6}$  E. Power Supply Regulators;

SS 25. Scan Converter #2, Camera & Overlap

- 1 A. Overlap Camera Control; SM-152  
2 B. (2) Camera Yoke Driver; SM-117E  
1 C. High Voltage Power Supply; SM-121B  
1 D. Overlap Write Video Amp; SM-151  
 $\frac{1}{6}$  E. Overlap Video Pre-Amp; CIC-16

SS 30. Control Panel

- 5 A. (5) Control Panel Interface; CIC-6  
1 B. Control and Animate Mode Switches; CIC-2  
1 C. Miscellaneous Function Switches; CIC-3  
1 D. Shaft Encoder Switches; CIC-4A  
1 E. Keyboard; Sai Pro# PN 17 0000 020 Rev E CIC-73  
 $\frac{1}{10}$  F. Video Switcher control; CIC-12  
G. Color Controller Switch Logic; CIC-W-13

4/21/80

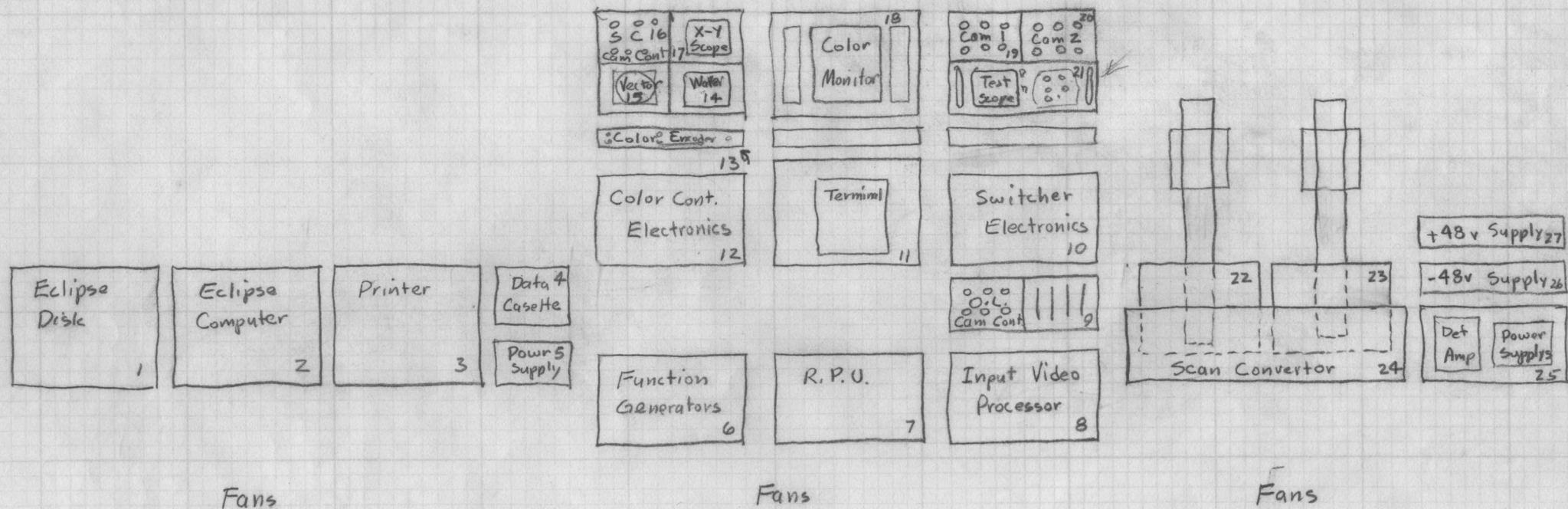
Hari,

Here are my recommendations and a more recent and complete equipment list. I think it will all still fit in our package. Call me with any questions

Ed

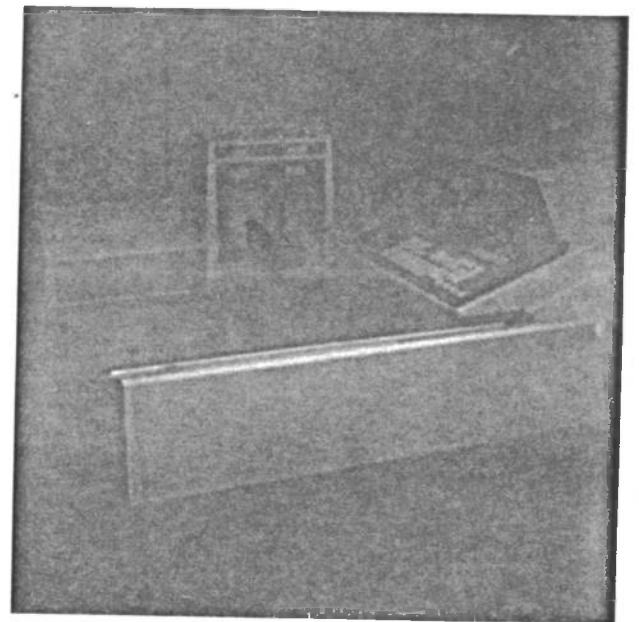
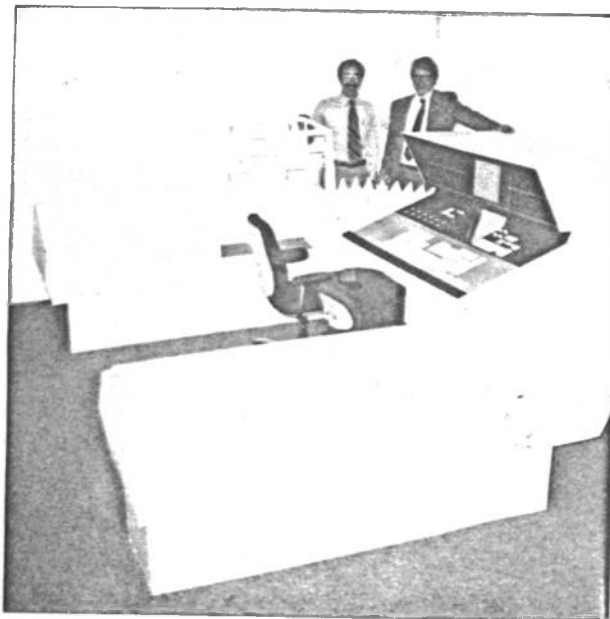


Controls for the Color Controller and the Switcher can be remote. Recommend that the controls on the slant be remote and somehow hinged so they can be moved out of the way when the electronic packages behind need service. The scan convertor camera control does not need to be accessible during operation, just during maintenance and adjustment.









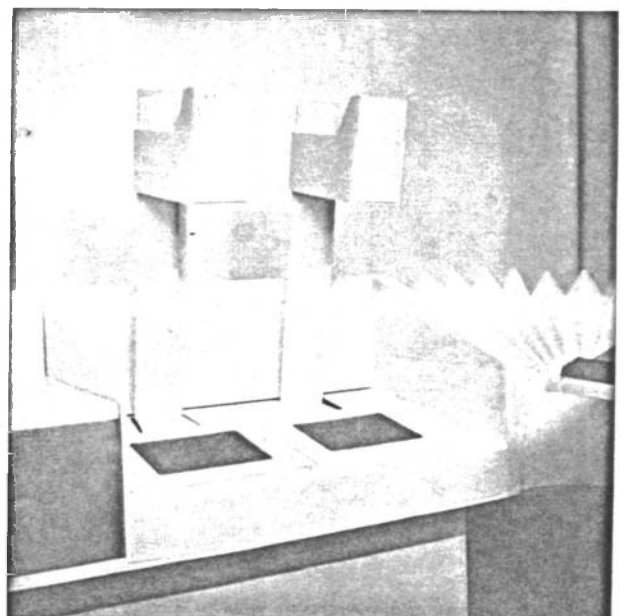
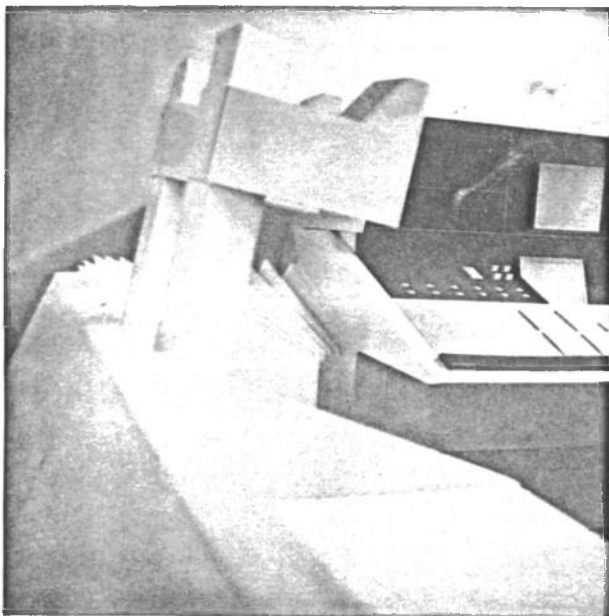
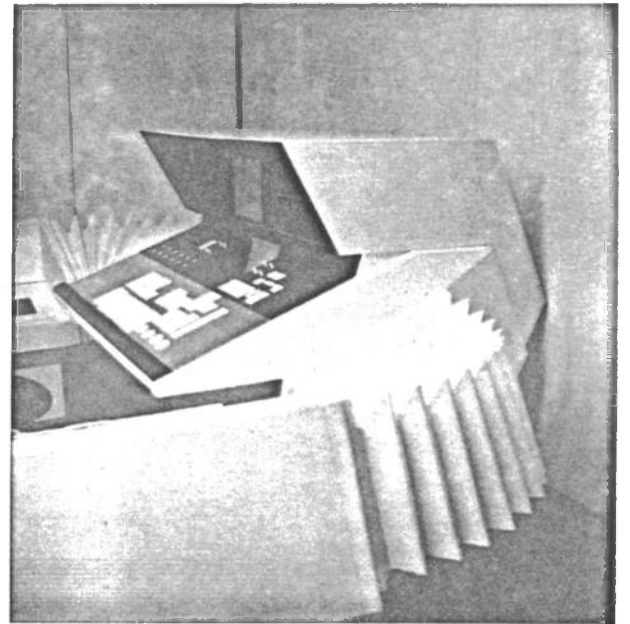
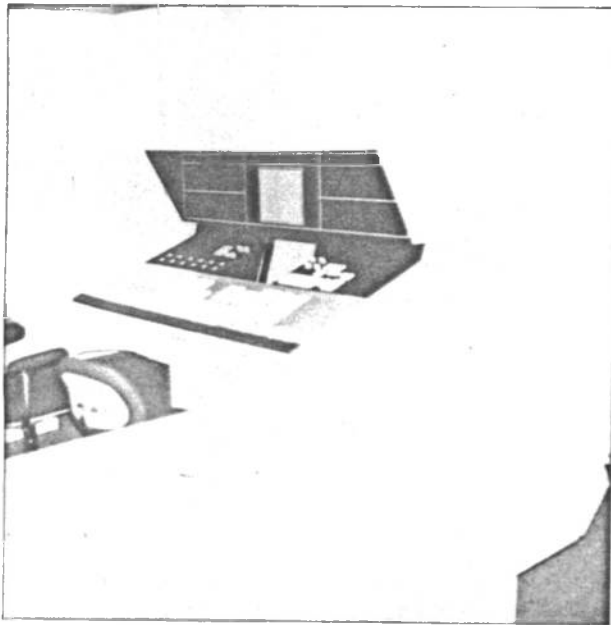
# S IV Equipment list

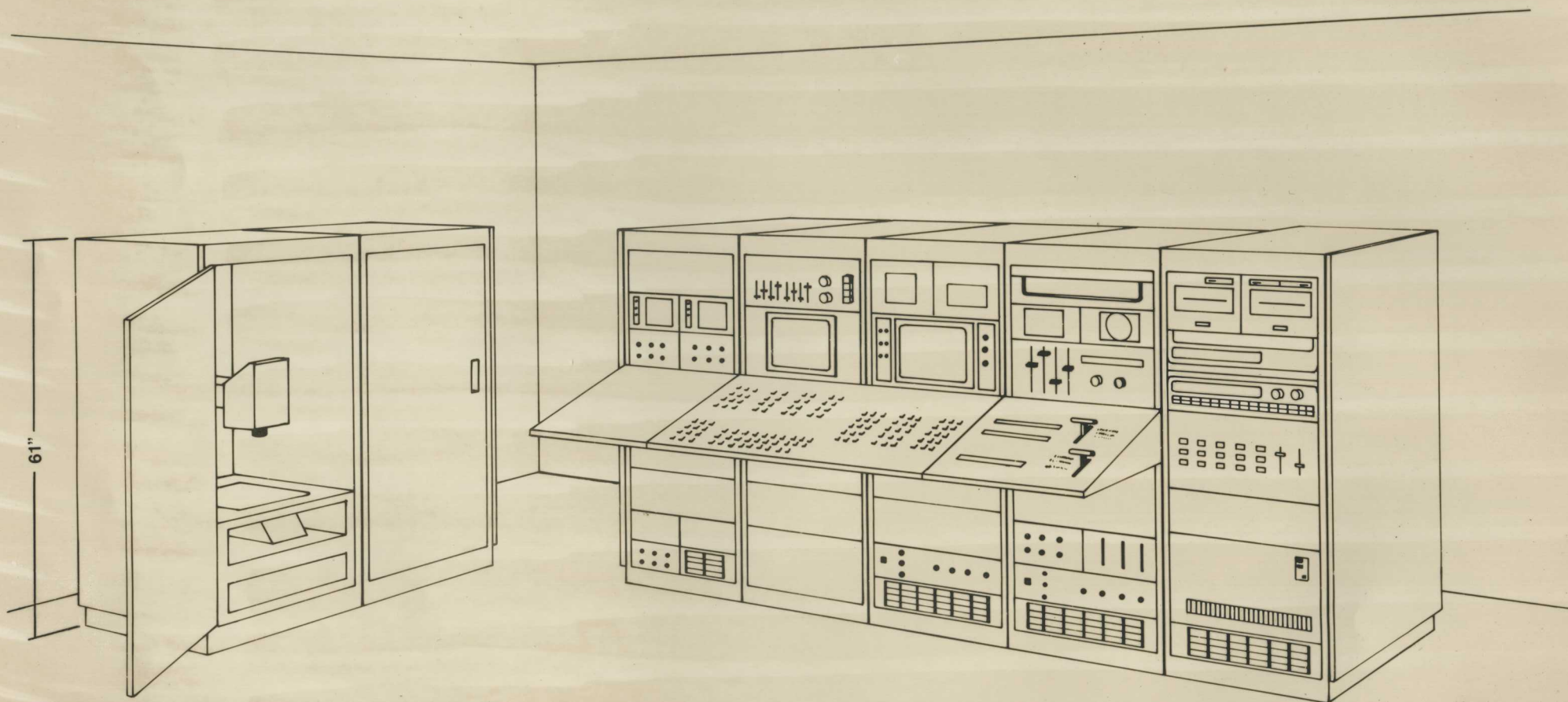
4/21/80  
9/18/80  
10/3/80

1. Eclipse Disk , DG # 6093 10 $\frac{1}{2}$ " x 19" x 30"
2. Eclipse Computer, DG 5130 10 $\frac{1}{2}$ " x 19" x 25"
3. Printer, Epson # MX80 10 $\frac{1}{2}$ " x 19" x 25"
4. Data Cartridge, Data Electronics # S-3 19" x 5 $\frac{1}{4}$ " x 9"
5. Data Cartridge Power Supply Eliminated
- ✓ 6. Function Generator (Oscillators) 8 $\frac{3}{4}$ " x 19" x 15"
- ✓ 7a R. P. U. 8 $\frac{3}{4}$ " x 19" x 15"
- ✓ 8. Input Video Processor 14" x 19" x 21"
9. Overlap Camera Control Included in Scan Converter units
10. Switcher Electronics, Computer Image 3081 14" x 19" x 15"
11. Digital Terminal, 14 $\frac{3}{4}$ "<sup>(13 $\frac{1}{4}$ )</sup> x 19" x 18"
- ✓ 12. Color Controller Electronics Included in Switcher unit
13. ✓ Color Encoder, Teknition # 3001 1 $\frac{3}{4}$ " x 19" x 15"
14. ✓ Waveform Monitor, Tek # 529 5 $\frac{1}{4}$ " x 9 $\frac{1}{2}$ " x 14"

15. ✓ Vector Monitor, Jek #604  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$
16. ✓ Scan Converter Camera Control, Cohn #1900  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$
17. ✓ X-Y Monitor, Jek #604  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$
18. ✓ Color Monitor, Jek #651HR  $10\frac{1}{4}" \times 19" \times 18"$
19. ✓ Input Camera #1 Control, Cohn #1900  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$
20. ✓ Input Camera #2 Control, Cohn #1900  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$
21. ✓ Test Oscilloscope, Jek #922  $5\frac{1}{4}" \times 19" \times 19"$
22. Artwork Unit #1, Bencher lite box, controls, camera column, Cohn camera head
23. Artwork Unit #2, Bencher lite box, controls, camera column, Cohn camera head
24. Scan Converter #1, Monitor & Def Amp  $8\frac{3}{4}" \times 8\frac{3}{4}" \times 40"$   
2 x  $10\frac{1}{2}" \times 24" \times 19"$
25. Scan Converter #2, SC camera & OVLp Camera  $8\frac{3}{4}" \times 19" \times 13"$
26. ✓ +48 volt Supply, Solar  $5\frac{1}{4}" \times 19" \times 9\frac{3}{4}"$
27. ✓ -48 volt Supply, Solar  $5\frac{1}{4}" \times 19" \times 9\frac{3}{4}"$
28. Power Supply Drawer
29. Control Panel







## SYSTEM IV

ENGINEERING PROTOTYPE  
COMPUTER IMAGE CORPORATION  
DENVER, COLORADO

Hari & Associates Inc. 3915 Howard Street Skokie, IL. 60076 312-677-3777

January 5, 1982

Ed Tiekman  
Computer Image Corporation  
2475 Second Avenue  
Suite 4  
Denver, Colorado 80223

Dear Ed:

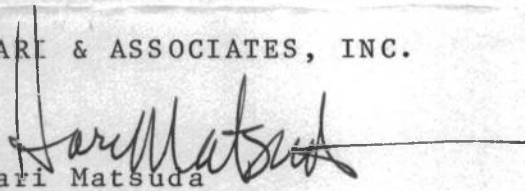
I had already sent the originals and a no-charge invoice for the cost of having the mylars made outside prior to receiving your last correspondence.

I hope what has happened in the past, regardless of where the blame lies, can now be laid to rest. You obviously will not hire us for future work but we might be in a position to utilize your company's service, in which case pleasant vibes would be requested.

The unit in the photograph looks darn good. I hope its' outcome has softened the edge of the blade at Computer Image. I would like to submit it to a design awards exhibit. A slide and an 8 x 10 photo would be desireable if you should have them available.

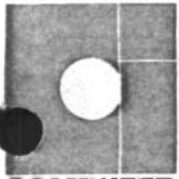
Sincerely,

HARI & ASSOCIATES, INC.

  
Hari Matsuda  
President

HM/ssg

cc: L. Harrison



**COMPUTER  
IMAGE**  
CORPORATION

2475 WEST  
SECOND  
AVENUE  
SUITE 4  
DENVER,  
COLORADO  
80223

TELEPHONE  
(303) 934-5801

December 28, 1981

Mr. Hari Matsuda  
President  
Hari & Associates, Inc.  
3915 Howard Street  
Skokie, Illinois 60076

RE: Invoice #11733 for \$708.75

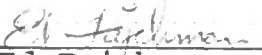
Dear Hari:

In question is the reason for invoice #11733 in the amount of \$708.75. I had requested the original set of drawings for the System IV package. These drawings I had considered the property of Computer Image as we had paid over \$27,000 for their development and production. The alternative of sending copies of quality good enough so that the required changes could be made on them was offered. We then received copies of that quality.

It does not seem reasonable that Computer Image be asked to pay again for the original or equivalent set of drawings. Therefore, I cannot endorse invoice #11733 for payment.

I am enclosing a photograph of System IV taken just before its' shipment to Luxembourg.

Sincerely yours,

  
Ed Tajchman  
Vice President  
Engineering

ET:pj

Enclosure: (1) picture, System IV





Hari & Associates Inc.

3915 Howard Street  
Skokie, IL. 60076  
312-677-3777

Date October 22, 1981

Invoice No. 11733

Purchase Order No.

TERMS: NET 30 DAYS

Computer Image Corporation  
2475 W. Second Ave.  
Suite 4  
Denver, CO 80223

ATTN: Lee Harrison

Reproducible Washable Mylars

\$708.75

RECEIVED OCT 26 1981

Project # 3357 Computer Image CI System 4

INV DATE \_\_\_\_\_ DATE PD \_\_\_\_\_  
INV # \_\_\_\_\_ CK # \_\_\_\_\_  
ACCT # \_\_\_\_\_ APPROVED \_\_\_\_\_  
JOB # \_\_\_\_\_

# REPRODUCTIONS



3915 OAKTON STREET • SKOKIE, ILLINOIS 60076 677-8230

SOLD  
TO

Kari Assoc.

3915 Howard

Skolio 22. 60076

ACCT. NO.

DATE 10-19-87

ORDER NO.

NO. 259809

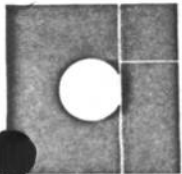
TERMS: NET 30 DAYS

538

[illegible]

10

3357



**COMPUTER  
IMAGE**  
CORPORATION

2475 WEST  
SECOND  
AVENUE  
SUITE 4  
DENVER,  
COLORADO  
80223

TELEPHONE  
(303) 934-5801

October 8, 1981

Mr. Hari Matsuda  
President  
Hari & Associates, Inc.  
3915 Howard Street  
Skokie, Illinois 60076

Dear Hari:

We are in the process of completing our first production System IV for delivery to Luxembourg. We obtained a one month extension in our delivery schedule but should be able to make the delivery in several weeks.

We now need the original set of drawings for the System IV package or copies made on reproducible, washable Mylar so that we change them to represent the "as delivered" state of the package. Some components still need to be ordered for the System IV being fabricated for Telerey in Mexico City and we need to submit accurate drawings when we place the order.

I would appreciate receiving the drawings as soon as possible as the Telerey System IV delivery date is rapidly approaching.

Thank you.

Sincerely yours,

Ed Tajchman  
Vice President  
Engineering

ET/pj

P.S. I'll send you some pictures to show you how the Luxembourg system turned out.



Hari & Associates Inc. 3915 Howard Street Skokie, IL. 60076 312-677-3777

September 24, 1980

Mr. Ed Teikman  
Computer Image Corp.  
2475 W. Second Avenue  
Suite 4  
Denver, CO 80223

Dear Ed:

We had a production meeting with Glenn and are looking forward to getting this project back on the road.

He pointed out several errors that will be corrected when we start up again. We are waiting for specific information on all of the components that will be installed into the system. The new type of printer will cause some changes but the advantages seem to be well worth the effort.

Changing the mounting of the color controller, switcher, and monitor video processor will solve the servicing problem. This will result in a smaller control panel but Glenn felt this would be acceptable. The enclosed drawings show three ways to mount these units. Please study them and contact us.

This also freed up space for the power supplies to be mounted in the main console.

The main control surface will now be supported by a 20° turret instead of a special bracket we had designed. This may cost a little more but should not be much.

It was decided that the shipping crate would be a reusable crate contracted by Amco. However, Computer Image would be required to furnish shock mounting information.



Page 2  
September 24, 1980  
Mr. Teikman

The quotes we received from Amco were based on 30 systems. There will be a price increase for 5 systems (about 10%). There was also a cost increase since we received the quote which amounted to about 10% (we'd better hurry and buy).

Their delivery schedule calls for six weeks, which appears to be well within our requirements. Are you still thinking in terms of January 15th for delivery of cabinets?

The wood cabinet parts can be made by an Amco supplier and this may be a good way to purchase the unit since they have worked together in the past. We will furnish all detail drawings to construct the cabinets.

The drawings we sent to you were to get information to you and get a reaction. I thought we sent you exploded views but I guess we only showed them to you and Lee when you were here.

Please get us all the information ASAP so we can keep this project on schedule.

Sincerely,

HARI & ASSOCIATES, INC.

*Hari Matsuda*  
*mmh*

Hari Matsuda  
President

HM/mmh  
enclosure

cc: Lee Harrison  
Glenn Hill

Hari & Associates Inc. 3915 Howard Street Skokie, IL. 60076 312-677-3777

July 17, 1980

Mr. Lee Harrison III  
Computer Image Corporation  
2475 W. Second Avenue  
Suite 4  
Denver, Colorado 80223

Dear Lee:

Enclosed please find the estimated cost list for the system 4 cabinetry and the separate breakdown on the fabricated metal parts.

Also enclosed are sketches showing our proposed solutions for the light box cover and the construction of the bellows. We are anxious to hear your comments on these proposals.

I spoke with Ed yesterday and he said he would provide me with specs on the terminal and the final control panel layout as soon as this information is available.

Final assembly drawings should be finished in a few days and we will shoot prints out to you right away.

Hope to hear from you soon.

Sincerely,

HARI & ASSOCIATES, INC.



Dale Murray

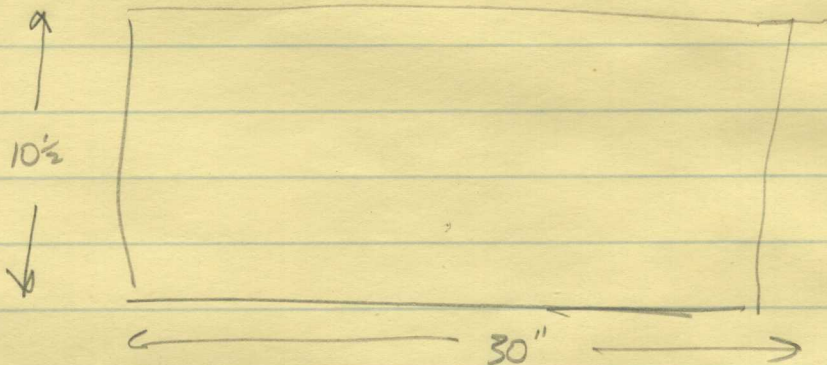
DM/mmh  
enclosures

Telco

8/12/80

Dale Murray

(312) 677-3777



Told Dale we wanted to package the scan converter in two 19" drawers, 10 1/2" high and 24" deep. He said no problem, the frame was actually 30" deep. He also said the drawings were about ready to be mailed along with a model.

Harri called later to say that they thought they'd send us the drawings for the sheet metal work and we could find someone to fabricate them here in Denver. They will get the fiber glass parts made there and will have \_\_\_\_\_ drill the required holes in the racks and those will all be shipped to Denver for assembly. Harri said the drawings had been shipped - I said I'd call them as soon as I received the material.



COMPUTER IMAGE SYSTEM IV  
Revised Version

Fabricated Sheet Metal Parts

| NO.   | Part Description                                    | Each Cost | Tooling | First Part<br>Total Cost |
|-------|-----------------------------------------------------|-----------|---------|--------------------------|
| 1     | Main Console Hood                                   | \$85.00   | --      | \$ 85.00                 |
| 1     | Main Console Back Panel                             | 85.00     | --      | 85.00                    |
| 2     | Main Console Lower Cover Panels (PR)                | 55.00     | --      | 110.00                   |
| 1     | Main Console Access Door                            | 65.00     | --      | 65.00                    |
| 2     | Main Console Table Support Brackets (r & l)         | 85.00     | --      | 170.00                   |
| 2     | Main Console Back Panel Support Brackets<br>(PR)    | 40.00     | --      | 80.00                    |
|       | Main Console Horizontal Supports<br>(square tubing) | 3@ 50.00  | --      | 50.00                    |
| 2     | Side Console Back Panels (PR)                       | 85.00     | --      | 170.00                   |
| 4     | Sheet Metal Cover for Bases                         | 25.00     | --      | 100.00                   |
| 8     | Welded Legs for Side Consoles                       | 10.00     | --      | 80.00                    |
|       | Misc. Assembly Hardware                             | 100.00    | --      | 100.00                   |
| TOTAL |                                                     |           |         | \$1095.00                |



AMCO

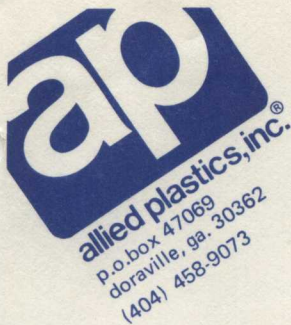
COMPUTER IMAGE SYSTEM IV  
Revised Version

PARTS LIST W/ ESTIMATED COSTS

| No.                   | Part Description                                                | Each Cost               | Tooling                                | First Part<br>Total Cost   |
|-----------------------|-----------------------------------------------------------------|-------------------------|----------------------------------------|----------------------------|
| 5                     | Frame Structures<br>(purchased cabinets)                        | \$945.00                | --                                     | \$945.00<br>1745           |
| 2                     | Urethane End Caps<br>(main console) (2 tools)                   | 2@ 15.00<br>250 230     | <sup>3,000</sup><br>\$5,000.00<br>5358 | \$5,015.00<br>3500<br>1774 |
| 4                     | Urethane End Caps<br>(side consoles) (2 tools)                  | 4@ 14.00<br>230         | <sup>3,000</sup><br>\$4,000.00         | \$4,014.00<br>3460         |
|                       | Fabricated Chipboard Cabinetry<br>(some formica covered pieces) | \$1,000.00<br>1200/wing | --<br>2400                             | \$1,000.00<br>2,400        |
| 1                     | Heat-Bent 3/16" plex dust<br>cover for light boxes              | 90.00                   | --                                     | \$ 90.00                   |
| 1                     | Vacuum Formed Esutcheon<br>for CRT Screen                       | 100.00                  | \$1,200.00                             | \$1,300.00                 |
| 2                     | Vinyl Bellows w/ Metal<br>Support Frame                         | 150.00<br>735           | --                                     | \$ 300.00<br>1470          |
|                       | FABRICATED SHEET METAL PARTS<br>(see separate breakdown)        | \$1095.00               | --                                     | \$1,095.00<br>4013 2587    |
| TOTAL PIECE PART COST |                                                                 | \$3466.00               |                                        |                            |
| TOTAL TOOLING COST    |                                                                 |                         | \$10,200.00                            |                            |
| TOTAL PROTOTYPE COSTS |                                                                 |                         |                                        | \$13,759.00                |

NOTE: ASSEMBLY LABOR AND SHIPPING CRATES ADDITIONAL





PLASTIC FABRICATION - STORE FIXTURES  
VACUUM FORMING - DIE CUTTING  
VISUAL COMMUNICATION

*telos 5/11/81 - asked for new quote from HC  
telos 5/23/81 - HC Cobb said he'd get Harris error  
changed and a quote out by tomorrow*

#021181HRC-1

## QUOTATION

TO: Hari & Associates  
3915 Howard Street  
Skokie, Illinois 60075

REFERENCE ABS Computer End Caps

F. O. B. Doraville, GA

APPROXIMATE SHIPPING DATE 8-9 Weeks ARO

TERMS

Deposit required unless otherwise arranged.

ATTENTION: Dale Murray

| ITEM NO. | QUANTITY            | DESCRIPTION                                                                    | UNIT PRICE * | 3          |
|----------|---------------------|--------------------------------------------------------------------------------|--------------|------------|
| 1.       |                     | Left end cap main console per drawing no. C-2553DD vacuum formed.              | \$412.00     | 5 \$185.00 |
| 2.       | <i>simplified -</i> | Tooling for Item #1                                                            |              | \$1634.00  |
| 3.       |                     | Side console left end cap per drawing no. C-2550-D vacuum formed without hole. | \$235.00     | \$120.00   |
| 4.       |                     | Same as Item #3 except with cut out hole.                                      | \$240.00     | \$125.00   |
| 5.       |                     | Tooling for Items 3 and 4.                                                     |              | \$1145.00  |
| 6.       |                     | Side console end cap right per drawing #C-2551-D vacuum formed without hole.   | \$235.00     | \$120.00   |
| 7.       |                     | Same as Item #6 except with hole.                                              | \$240.00     | \$125.00   |
| 8.       |                     | Tooling for Items 6 and 7.                                                     |              | \$1145.00  |
| 9.       |                     | Right end cap of main console per drawing no. C-2553-DD vacuum formed.         | \$412.00     | \$185.00   |
| 10.      |                     | Tooling for Item #9.                                                           |              | \$1434.00  |

REMARKS: \*PRICES GOOD THIRTY (30) DAYS.

A 50% deposit is required on all tooling, balance on approval of prototype.

*telos 6/1/81*  $\leftarrow$   $\frac{1860}{1774}$   $\frac{1230}{5358}$   $\frac{940}{2679}$   $\frac{940}{4300}$   
50% = 2679

Enclosures: 3

ALLIED PLASTICS, INC.

*Herman R. Cobb*

BY: Herman R. Cobb, Vice Pres.

DATE: March 4, 1981



**allied plastics, inc.**

Confidential Application for Credit

COMPANY NAME: \_\_\_\_\_

SUBSIDIARY/DIVISION OF: \_\_\_\_\_

HEADQUARTERS ADDRESS: \_\_\_\_\_

LOCAL ADDRESS: \_\_\_\_\_ TELEPHONE NO. \_\_\_\_\_

SOLE PROPRIETORSHIP \_\_\_\_\_ PARTNERSHIP \_\_\_\_\_ CORPORATION \_\_\_\_\_ OTHER \_\_\_\_\_

TYPE OF BUSINESS \_\_\_\_\_ YEAR STARTED \_\_\_\_\_

ANNUAL SALES VOLUME \_\_\_\_\_ D & B RATED? ☐ YES ☐ NO

INDIVIDUALS AUTHORIZED TO PURCHASE

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
TITLE

TRADE REFERENCES - NAME AND ADDRESS

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

BANK REFERENCES - NAME, ADDRESS AND NAME OF PERSON TO CONTACT

1. \_\_\_\_\_

2. \_\_\_\_\_

SPECIAL COMMENTS:

\_\_\_\_\_

SIGNATURE OF

PRINCIPAL OR OFFICER \_\_\_\_\_

DATE

\*Please Note: It shall be the obligation of the applicant to inform Allied Plastics in writing, of any change in the information given here or in the financial status of the applicant which would reasonably be assumed to affect Allied Plastics issuance of credit to this applicant.



allied plastics, inc.

NOTICE

Any tooling, not made by ALLIED PLASTICS, but which is given to us to use for a customer's benefit, is conditionally accepted by ALLIED PLASTICS with the following proviso:

That where, through no negligence on the part of ALLIED PLASTICS, said tool is found defective in any manner for the purpose intended, ALLIED PLASTICS will communicate same to said customer and then with said customer's prior approval and at said customer's sole expense will repair or re-work said tooling. Any delays in production or losses of material due to such defect shall be the sole responsibility of the customer and ALLIED PLASTICS shall be held harmless therefor.

Subject to the above proviso, tooling, whether made by ALLIED PLASTICS, INC. or some outside source, will be maintained in good working order and kept in storage without charge for twelve (12) months from date of last production order. Tooling not used beyond this period of time will be considered obsolete and subject to disposal. An attempt will be made to notify the customer before so disposing.





FORM TO BE ATTACHED TO CUSTOMER PURCHASE ORDER

Approval for Allied Plastics, Inc. to order custom materials according to quote # \_\_\_\_\_.

Prototypes may be run out of material which is similar to the material quoted for the job in order for the customer to get a reasonable idea of what the parts will look like and how they will perform. Note, however, that once the customer "go ahead" is given and custom run materials are ordered by Allied Plastics for the particular job, any cancellation of that job by the customer will precipitate a charge to the customer for the material ordered and for any labor incurred by Allied Plastics on the job prior to or consequent with notification of the cancellation by customer.

All orders for custom made parts are subject to an over or under run of 10%.

A 50% deposit is required on all tooling. The balance is due upon approval of prototype.

DATE: \_\_\_\_\_

CUSTOMER: \_\_\_\_\_

teleo

7/16/80

Dale Murray

Hari Associates

Monitor Jeleray - specs as to size

Dale needs

chip board table with Formica covering  
with controls

black Formica with black  
anodized aluminum

need to have size specs of aluminum plate holding controls if we want  
the holes to be routed out to make a nice flush fit with the Formica top

zinc dichromate, plating necessary?

Exact controls used

Exact terminal monitor size specifications

}

call Dale when these  
are determined

Page 2  
April 16, 1980  
Mr. Lee Harrison

HAR I  
@ 45/hr  
1200

|                    |                                                                                                                                                                         |             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 4/1/80             | PHASE I<br>Information gathering<br>Volume studies<br>Design conceptualizations<br>Preliminary studies<br>For Nab (1 man week)<br>Line drawings of components rendering | 3 man weeks |
| 4/14/80            | PHASE II<br>Develop design direction<br>Human factors studies                                                                                                           | 2 man weeks |
| 5/1/80             | PHASE III<br>Develop design                                                                                                                                             | 8 man weeks |
| 7/1/80             | PHASE IV<br>Prototype coordination                                                                                                                                      | 2 man weeks |
| 9/1/80-<br>10/1/80 | PHASE V<br>Prototype parts complete                                                                                                                                     |             |

15 man weeks  
@ 40 hrs/week  
@ 45/hr =

+ test cost 7

345  
600  
\$ 27,000  
13,758.00  
40,759

as of 9/9/80

\$ 23,248.15  
- 650  
22,6



9/17/90

What agreement do we have with Hari?

are his estimates firm or

is he just hourly with every request costing C I more?

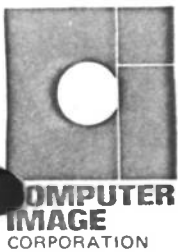
There is a lot of detail work left to do - from detailed engineering drawings to specifying nuts & bolts, screws, casters ect.

I think it will cost a lot more to have him do this.

Telco between LHTL & Hari

Hari will do the job needed to assure that we will have a good enclosure for about his estimate which was for 15 man weeks at a cost of \$450/hr which comes to \$27,000. Joe told him that we had already been billed for \$23,248.15 and had paid all but ~ \$600 of this so we didn't expect too much more billing. Joe also talked to Hari and they discussed how the drawings he had sent us were not working drawings. We expect Hari to supply adequate documentation to suppliers of his choice so that the proper parts will be delivered to us to enable us to put an enclosure together.





2475 WEST  
SECOND  
AVENUE  
SUITE 4  
DENVER,  
COLORADO  
80223  
TELEPHONE  
(303) 934-5801

August 6, 1981

Mr. Hari Matsuda  
President  
Hari & Associates, Inc.  
3915 Howard Street  
Skokie, Illinois 60076

RE: Letter of July 16, 1981 to Lee Harrison III

Dear Hari:

The rendering that you made of the proposed System IV package has been well received by almost everyone. I was apprehensive about the cost for the package design and fabrication but was convinced that a striking package was necessary for our effort to lease System IVs. I accepted the premise that it was important to obtain the services of an experienced industrial designer since our expertise is in designing unique electronic systems and not in packaging them.

I am now very disappointed in the results we have received from our investment of over \$27,000 for the design of the System IV package. According to a copy of an estimate for costs to develop a System IV package through prototype parts complete, from Hari to Lee, the total cost for the design effort would be \$27,000. However, the design materials that we have received from Hari & Associates have been so incomplete that we have had to use one of our engineers, Glenn Hill about  $\frac{1}{2}$  time to redesign and/or correct errors. Glenn has even had to conceive methods of performing certain functions, i.e.; locate a manufacturer for the bellows, design the entire control panel including cabinetry and frame, redesign or correct errors on the printer support tray, side console back hood, main console hood, main console hood supports and end caps. We have had to hire a mechanical engineer to redesign the side console leg assembly and to design the support for the castors for the main console, support for the bellows and bracing to strengthen the main console.

Our biggest disappointment has been in the quality of the drawings that we have received. None of them were adequate for a supplier to use to fabricate parts. Many required details were missing such as; fastener type, hole sizes and location, type of material and the finish specifications.

August 6, 1981  
Mr. Hari Matsuda  
Page 2

Most distressing though, were the multitude of dimensioning errors and poor mechanical design. Almost every drawing that we received should be redone by an experienced mechanical designer/draftsman to insure completeness and accuracy. This kind of checking is very expensive and we had not expected to need to provide this effort based on the quotation.

Another item that distresses me is the seeming lack of effort to hold fabrication costs down. Many component designs seem unnecessarily complex and thereby expensive to fabricate where the complexity does not seem to be necessary for the overall design. Some examples are; the end cap design which contained many complex angles that greatly increase tooling charges, the side console back hoods which were designed to be too large for easy fabrication and the bellows which were very expensive to fabricate. The many different materials used; formica covered wood, vinyl and painted metal, also caused matching problems.

Then there is the problem of the latest error of which we are aware. One set of bellows arrived from A&A Manufacturing Co. for which we paid \$1,462 plus \$680.00 for material. It turns out that the drawing that was supplied to A&A by Hari and Associates was incorrect and modifications to the bellows must be made for them to be used. In addition, the bellows are not self supporting nor has any design for bellows support been submitted. This will be an expensive item that is required for the package design to be implemented. We feel, that by prior verbal agreement about who pays for repairing errors, that Hari & Associates should pay for the rework.

For the type of fee charged for the design, I had expected a complete set of engineering drawings including all details and accurate dimensions. I expected that the design would be implemented using good mechanical engineering techniques. For such a fee, I expected the designers to be aware of and to specify the best materials and purchased components available for the job. In these expectations I have been disappointed and I am not willing to agree to pay additional sums to obtain the designs for which we have already paid.

August 6, 1981  
Mr. Hari Matsuda  
Page 3

Sincerely yours,

ed

Ed Tajchman  
Vice President  
Engineering

ET/pj

cc: Lee Harrison III



May 12, 1980

I UNDERSTAND THAT IT HAS BEEN PROPOSED THAT THE ART INPUT CAMERA ON SYSTEM IV BE PERMANENTLY AFFIXED TO GIVE A SINGLE "STANDARD FIELD SIZE".

I MUST OPPOSE THIS DESIGN BECAUSE:

- 1) OUR LAYOUTS ARE MADE EXACTLY AS IN CONVENTIONAL CEL ANIMATION: FIGURES ARE DRAWN, TO SIZE, AND IN PLACE, OVER A BACKGROUND. THE BACKGROUND IS PAINTED FROM THE LAYOUT, AND THE FIGURES' SECTIONS ARE SELECTED FROM IT.

WE TRACE THE FIGURES FROM THE LAYOUT BY SECTIONS. ALL THE SECTIONS ARE TOTALLY NONSTANDARD AS TO SIZE AND SHAPE.

- 2) TO ACHIEVE A REASONABLE ECONOMY IN FILM COSTS AND IN PROCESSING TIME, THE SECTIONS FOR SEVERAL SCENES ARE PASTED UP ON A SINGLE LARGE SHEET OF POSTERBOARD, RUBILITHED, AND SHOT. PIECES OF A SINGLE SCENE MAY BE SPREAD OVER MORE THAN ONE BOARD.
- 3) THE LARGE SHEET OF KODALITH THUS PRODUCED IS CUT APART, SORTED, AND THE SECTIONS ASSEMBLED ONTO THE INDIVIDUAL FINISHED CELS. IT IS AT THIS POINT WE ACTUALLY SEE THE SIZE OF EACH FINISHED CEL.
- 4) ON OCCASION, WE WILL GET A CEL THAT IS ONLY 'MARGINAL' — SLIGHTLY OVERSIZE, MISPOSITIONED, SKEWED, OR UNDERSIZE. THESE PRESENT ONLY A MINOR PROBLEM, AS WE CAN ACCOMMODATE THEM EASILY.

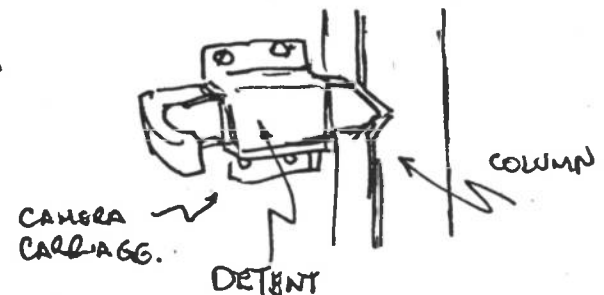
OBVIOUSLY, WE CAN CHANGE THE PROCEDURE FOR CREATING CELS AT ANY OF SEVERAL PLACES TO PRODUCE A "STANDARD-SIZE-KODALITH" — BUT ONLY AT THE COST OF INCREASING THE REQUIREMENTS FOR TIME, MATERIALS, AND/OR TRAINED PERSONNEL.

- a) TIME. WE HAVEN'T GOT IT. MOST JOBS START WITH ONLY ONE CEL PER MACHINE AND PREPARATION CONTINUES CONCURRENTLY WITH THE JOBS IN PROGRESS.
- b) MATERIALS. EASY, AND RELATIVELY INEXPENSIVE.
- c) TRAINED PERSONNEL. BAD. OUR BASIC STRATEGY IS TO MAINTAIN A CADRE OF TRAINED PEOPLE THAT WE CAN SUPPLEMENT IN TIMES OF OVERLOAD WITH FREELANCERS. IF WE MUST SPEND TIME TRAINING FREELANCERS IN A MORE COMPLEX PROCEDURE, WE DELAY THE START OF KODALITH PRODUCTION, INCREASE PERSONNEL COSTS, AND RISK ERRORS THAT WILL DELAY THE JOB. IN ADDITION, THE LOSS OF OUR TRAINED PEOPLE COULD CAUSE A SERIOUS TEMPORARY CRIPPLING OF CEL PRODUCTION.... AND OUR TURNOVER IN TRAINED PEOPLE IS INCREDIBLE.

MY RECOMMENDATIONS, IN DESCENDING ORDER OF DESIRABILITY, ARE:

- 1) AN INPUT-CAMERA STAND SIMILAR TO AN ANIMATION STAND OR TITLE STAND, ABLE TO ZOOM, MOVE ARTWORK OR CAMERA N-S AND E-W, AND WITH AT LEAST  $10^\circ$  — PREFERABLY  $360^\circ$  — OF SPIN AVAILABLE FOR THE CELS. ALL MOVEMENTS EQUIPPED WITH LARGE EASY-TO-READ VEEDEH-ROOT TYPE COUNTERS, SO THAT ANY SETTING CAN BE REPEATED AT WILL.
- 2) AN INPUT CAMERA STAND INCORPORATING ECONOMIES ON THE ABOVE OBJECTIVES SUCH AS A CAMERA ZOOM COLUMN INCORPORATING SPRING-LOADED DETENTS EVERY 6", A N-S/E-W TABLE WITH SIMILAR DETENTS EVERY  $\frac{1}{2}$  INCH, AND A SPIN TABLE WITH DETENTS EVERY DEGREE OR  $\frac{1}{2}$  DEGREE, ALL PLAINLY MARKED WITH PAINTED MARKERS/NUMBERS BY THE 'ZERO' NOTCHES.

THIS APPROACH WOULD BE SIMPLE, INEXPENSIVE, AND VERY RELIABLE AND REPEATABLE.



- 3) USING THE INPUT CAMERA'S ELECTRONICS ADJUSTMENTS TO CHANGE SIZE AND ASPECT RATIO TO ACCOMMODATE THE ARTWORK. LOSE SPIN, N-S/E-W. WE HAVE REPEATABLE SETTINGS ON THE CAMERA CONTROL ADJUSTMENT KNOBS.  
BAD. REQUIRES NEAR-PERFECT CELS, AND, IF A SMALL CEL HAS BEEN UP FOR MORE THAN AN HOUR, THE CAMERA WILL REQUIRE NEARLY ANOTHER HOUR TO 'RESENSITIZE' IN THE UNUSED AREA. ADVERSELY AFFECTS CAMERA SHADING AND ADJUSTMENTS... REALLY ONLY SUITABLE IN EMERGENCIES.

I HOPE THESE OBSERVATIONS HAVE BEEN HELPFUL.

Dale

# SPECIFICATIONS OF THE CABINET-MOUNTED COMPONENTS

| Item | Component | Number in Sub-system | Maximum Operating Temperature |       | Primary Power * |    |                               | Cabinet Height Required |           |      | Weight | Power Dissipation (Max Watts) | Preferred Location or Remarks | Operating Humidity (Relative) |     |                                                                                                           |      |    |
|------|-----------|----------------------|-------------------------------|-------|-----------------|----|-------------------------------|-------------------------|-----------|------|--------|-------------------------------|-------------------------------|-------------------------------|-----|-----------------------------------------------------------------------------------------------------------|------|----|
|      |           |                      | Component                     | Media |                 |    |                               |                         |           |      |        |                               |                               | min                           | max |                                                                                                           |      |    |
|      |           |                      | °F                            | °C    | °F              | °C | Current (nominal Draw) (Amps) | Voltage ±ΔV             | Frequency | Area | in.    | cm                            |                               | lbs                           | kg  | min                                                                                                       | %max |    |
| A    | (120V)    | 1-4                  | 110                           | 43    | 90              | 32 | 4.9                           | 120 +10% -15%           | 60Hz ±1Hz | 6    | 10.5   | 26.7                          | 150                           | 67                            | 500 | 1. AREAS 3-8 AND 9-14 FOR OPERATOR CONVENIENCE                                                            | 20   | 80 |
|      | (100V)    | 1-4                  | 110                           | 43    | 90              | 32 | 5.7                           | 100 +10% -15%           | 50Hz ±1Hz | 6    | 10.5   | 26.7                          | 150                           | 67                            | 500 | 2. MAX 2 DRIVES PER CABINET ADJACENT AREAS                                                                | 20   | 80 |
|      | (220V)    | 1-4                  | 110                           | 43    | 90              | 32 | 2.6                           | 220 +10% -15%           | 50Hz ±1Hz | 6    | 10.5   | 26.7                          | 150                           | 67                            | 500 | 3. POWERCORD 5ft./1.52m long<br>4. AT LEAST 3" BELOW COMPUTER CABINET MUST BE EQUIPPED WITH ANT-TIP LEGS. | 20   | 80 |
|      | (240V)    | 1-4                  | 110                           | 43    | 90              | 32 | 2.4                           | 240 +10% -15%           | 50Hz ±1Hz | 6    | 10.5   | 26.7                          | 150                           | 67                            | 500 |                                                                                                           | 20   | 80 |

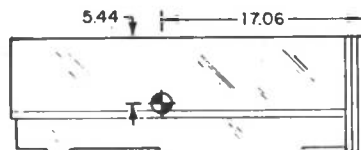
DG-0194

MAXIMUM OPERATING ALTITUDE 6000ft./1828m FOR ALL DISC DRIVES

| Voltage    | Power Cable Length |      | Power Cable Plug | Mating Receptacle on Power Drop | Mating Receptacle in Wall |
|------------|--------------------|------|------------------|---------------------------------|---------------------------|
|            | ft                 | m    |                  |                                 |                           |
| 100V, 50Hz | 5                  | 1.52 | 5-15P            | 5-15R                           | 5-15R                     |
| 120V, 60Hz | 5                  | 1.52 | 5-15P            | 5-15R                           | 5-15R                     |
| 220V, 50Hz | 5                  | 1.52 | 6-15P            | 6-15R                           | 6-15R                     |
| 240V, 50Hz | 5                  | 1.52 | 6-15P            | 6-15R                           | 6-15R                     |

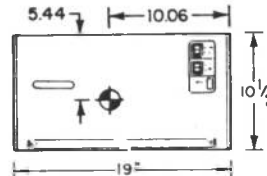
DG-0277

\* FOR NOVA STYLE CABINETS, MOD KIT 005-005249 IS REQUIRED. SEE 010 000556.

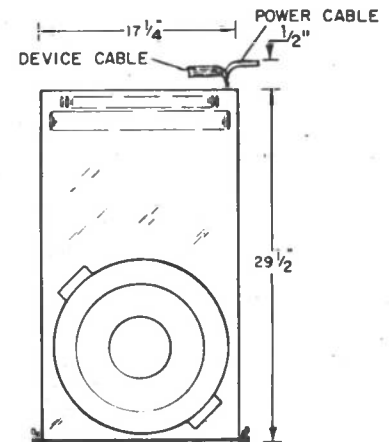


DG-02628

SIDE VIEW

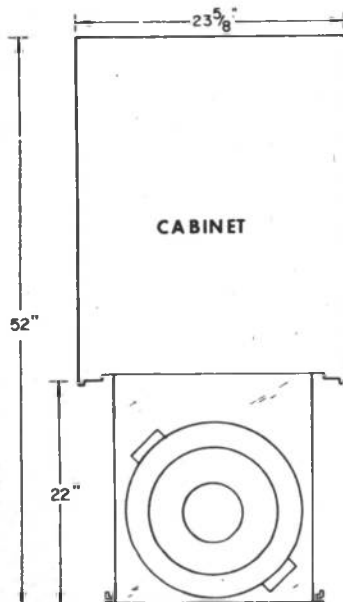


FRONT VIEW

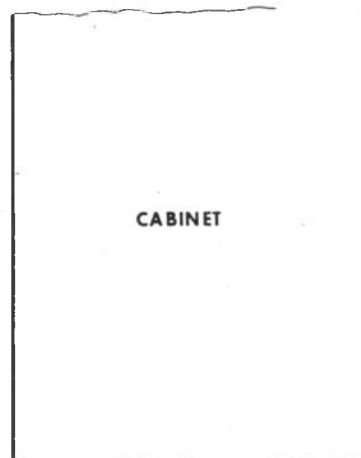


TOP VIEW

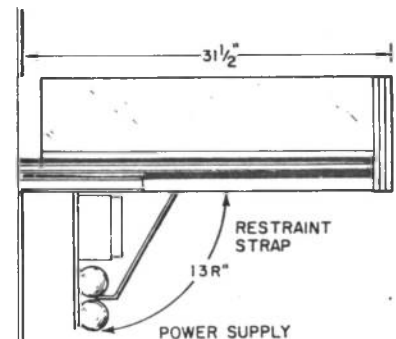
NOTE: THE READ/WRITE HEADS ARE CAREFULLY ALIGNED AT THE FACTORY, AND THE EQUIPMENT IS PACKED IN PROTECTIVE CONTAINERS TO PREVENT DAMAGE DURING SHIPMENT. HOWEVER, ROUGH HANDLING MAY MOVE THE HEADS, SO THAT RE-ALIGNMENT ON-SITE MAY BE REQUIRED. IF THE HEADS DO REQUIRE ALIGNMENT, REFER TO THE PROCEDURE INCLUDED IN THE DOCUMENTATION SUPPLIED WITH THE EQUIPMENT.



OPERATING DIMENSIONS



SERVICE DIMENSIONS



CAUTION: EXERCISE EXTREME CARE WHEN LOWERING THE POWER SUPPLY. IF ALLOWED TO FALL FREELY, IT WILL OVERCOME THE RESTRAINT STRAP AND SWING INTO AND DAMAGE COMPONENTS IN THE CABINET BELOW THE DISC DRIVE.

maximum  
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type  
stem  
cessor  
DG-02672  
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tem.  
ect disk-  
n SS  
for tota  
connect  
unt  
abinet.  
omputer.  
DG-02673  
processor  
DG-02674

oller's  
olt Current  
(Amps)  
1.0

|     |     |     |     |          |                  |
|-----|-----|-----|-----|----------|------------------|
| 08  | 09  | 10  | 11  | DRAWN    | APPROVED         |
| 169 | 274 | 674 | 674 | CHECKED  | FIRST USED ON    |
| 169 | 274 | 674 | 674 | ENGINEER | CODE IDENT 34984 |

TITLE  
CARTRIDGE DG/ DISC  
SERIES 6045-6051

| DATA GENERAL CORPORATION      |      |                |     |
|-------------------------------|------|----------------|-----|
| SOUTHBORO MASSACHUSETTS 01772 |      |                |     |
| SIZE                          | CODE | DRAWING NUMBER | REV |
| C                             | 010  | 000110         | 14  |



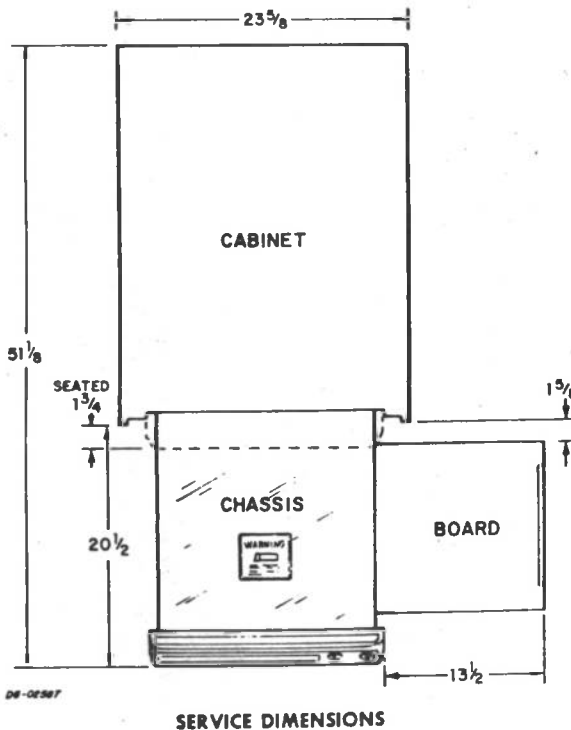
# SPECIFICATIONS OF THE CABINET-MOUNTED COMPONENTS

| Item | Component      | Number in Sub-system | Maximum Operating Temperature |          | Primary Power                     |       |       |      |      | Cabinet Height Required |      |       | Weight                            |       | Power Dissipation (Max Watts) | Preferred Location or Remarks | Operating Humidity (Relative) |       |
|------|----------------|----------------------|-------------------------------|----------|-----------------------------------|-------|-------|------|------|-------------------------|------|-------|-----------------------------------|-------|-------------------------------|-------------------------------|-------------------------------|-------|
|      |                |                      | Component °F                  | Media °C |                                   |       |       |      |      |                         |      |       |                                   |       |                               |                               | min                           | % max |
|      |                |                      | °C                            |          | Volts                             | Hz    | Phase | Cond | Amps | Area                    | in.  | cm    | lbs                               | kg    |                               |                               |                               |       |
| A    | S/130<br>100 V |                      | 110                           | 45       | 100 <sup>+10</sup> <sub>-5</sub>  | 47-63 | I     | 3    | 10.5 | 6                       | 10.5 | 26.67 | 130 <sup>+10</sup> <sub>-5</sub>  | 58.96 | 1050                          | AREAS 11-16                   | 20                            | 90    |
|      | 120v           |                      | 110                           | 45       | 120 <sup>+10</sup> <sub>-5</sub>  | 47-63 | I     | 3    | 8.75 | 6                       | 10.5 | 26.67 | 130 <sup>+10</sup> <sub>-5</sub>  | 58.96 | 1050                          | AREAS 11-16                   | 20                            | 90    |
|      | 220v           |                      | 110                           | 45       | 220 <sup>+10</sup> <sub>-15</sub> | 47-63 | I     | 3    | 4.77 | 6                       | 10.5 | 26.67 | 130 <sup>+10</sup> <sub>-15</sub> | 58.96 | 1050                          | AREAS 11-16                   | 20                            | 90    |
|      | 240v           |                      | 110                           | 45       | 240 <sup>+10</sup> <sub>-5</sub>  | 47-63 | I     | 3    | 4.38 | 6                       | 10.5 | 26.67 | 130 <sup>+10</sup> <sub>-5</sub>  | 58.96 | 1050                          | AREAS 11-16                   | 20                            | 90    |

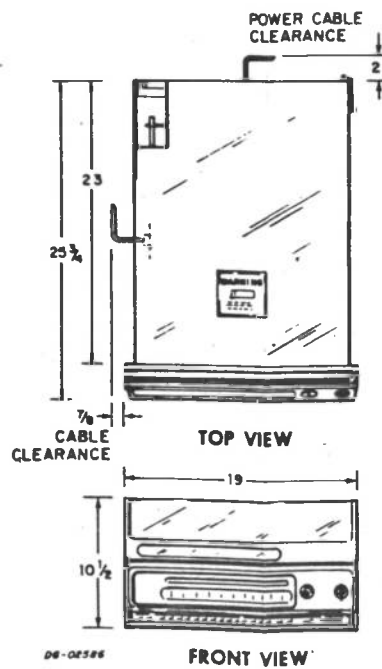
DE-01914

| Voltage | Power Cable Length |     | Power Cable Plug | Mating Receptacle on Power Drop | Mating Receptacle in Wall |
|---------|--------------------|-----|------------------|---------------------------------|---------------------------|
|         | ft                 | m   |                  |                                 |                           |
| 100     | 6                  | 1.8 | 5-15P            | 5-15R                           | 5-15R                     |
| 120     | 6                  | 1.8 | 5-15P            | 5-15R                           | 5-15R                     |
| 220     | 6                  | 1.8 | 6-15P            | 6-15R                           | 6-15R                     |
| 240     | 6                  | 1.8 | 6-15P            | 6-15R                           | 6-15R                     |

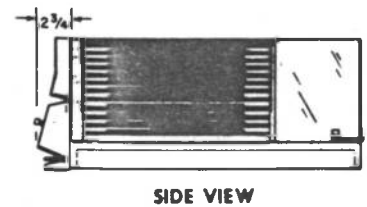
DE-02717



DE-02587



DE-02586



|                              |                              |
|------------------------------|------------------------------|
| DRAWN<br>J. J. J. 10/2/72    | APPROVED<br>J. J. J. 10/2/72 |
| CHECKED<br>J. J. J. 10/2/72  | FIRST USED ON                |
| ENGINEER<br>J. J. J. 10/2/72 | CODE IDENT 34984             |

TITLE  
ECLIPSE S/130

DATA GENERAL CORPORATION

SOUTHBORO, MASSACHUSETTS 01772

|           |             |                          |            |
|-----------|-------------|--------------------------|------------|
| SIZE<br>C | CODE<br>010 | DRAWING NUMBER<br>000142 | REV.<br>01 |
|-----------|-------------|--------------------------|------------|

4/29/80

### Comments on new configuration for Video Bench

like having the high resolution monitor where it can be easily viewed while adjusting the artwork input cameras.

1. all 3 cameras are identical - head is  $4" \times 4" \times 10"$  - must allow space for cable & lens
2. all 3 camera columns and mounts should probably be identical - the scanconverter column should be shorter
3. Need to keep ambient light from reflecting into the SC camera

Easier packaging problems

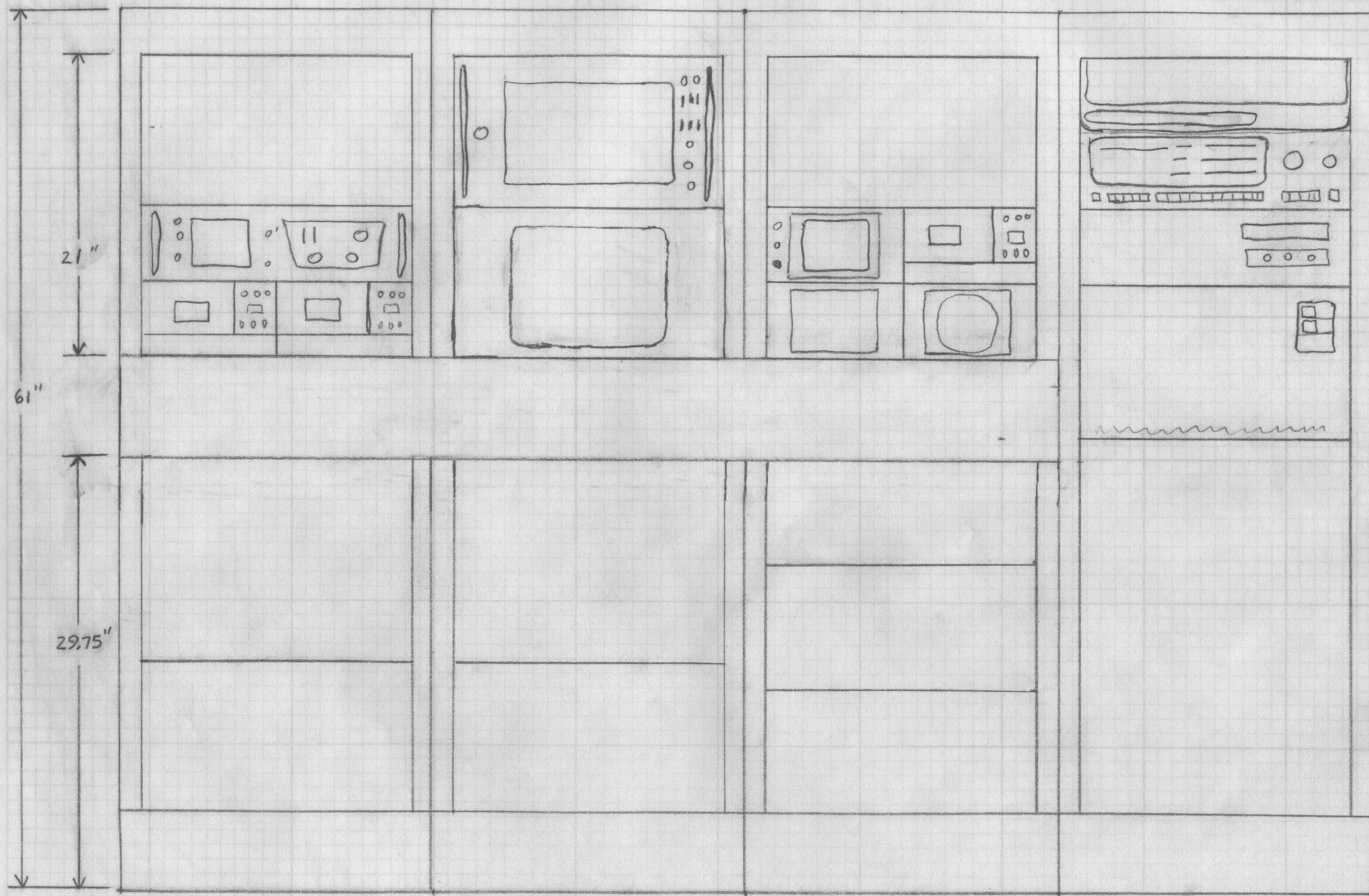
Better operational characteristics

Talked to Hari on 4/30/80

They're looking for some standard racks to use as a base

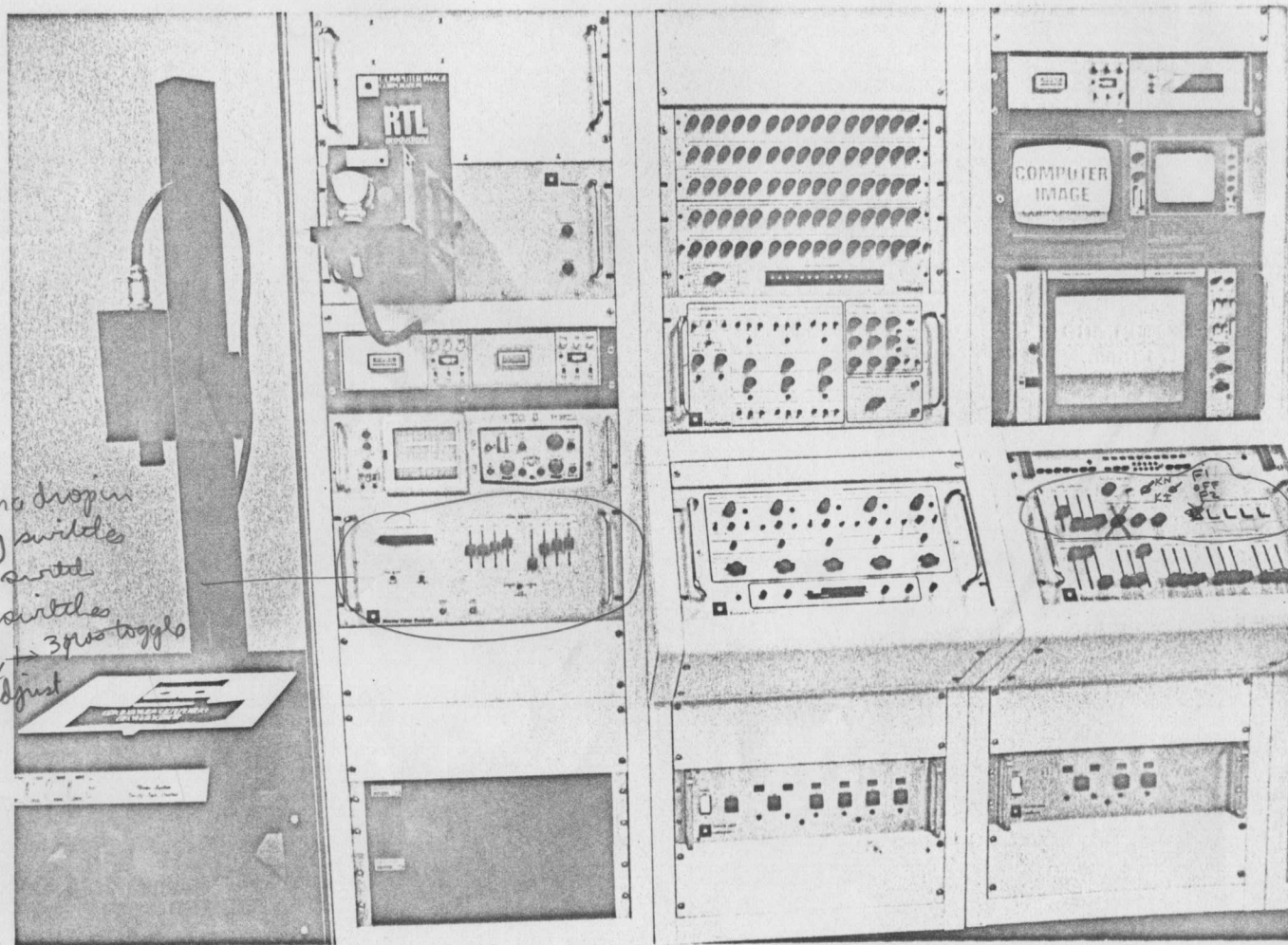
It's a tougher problem than he initially thought





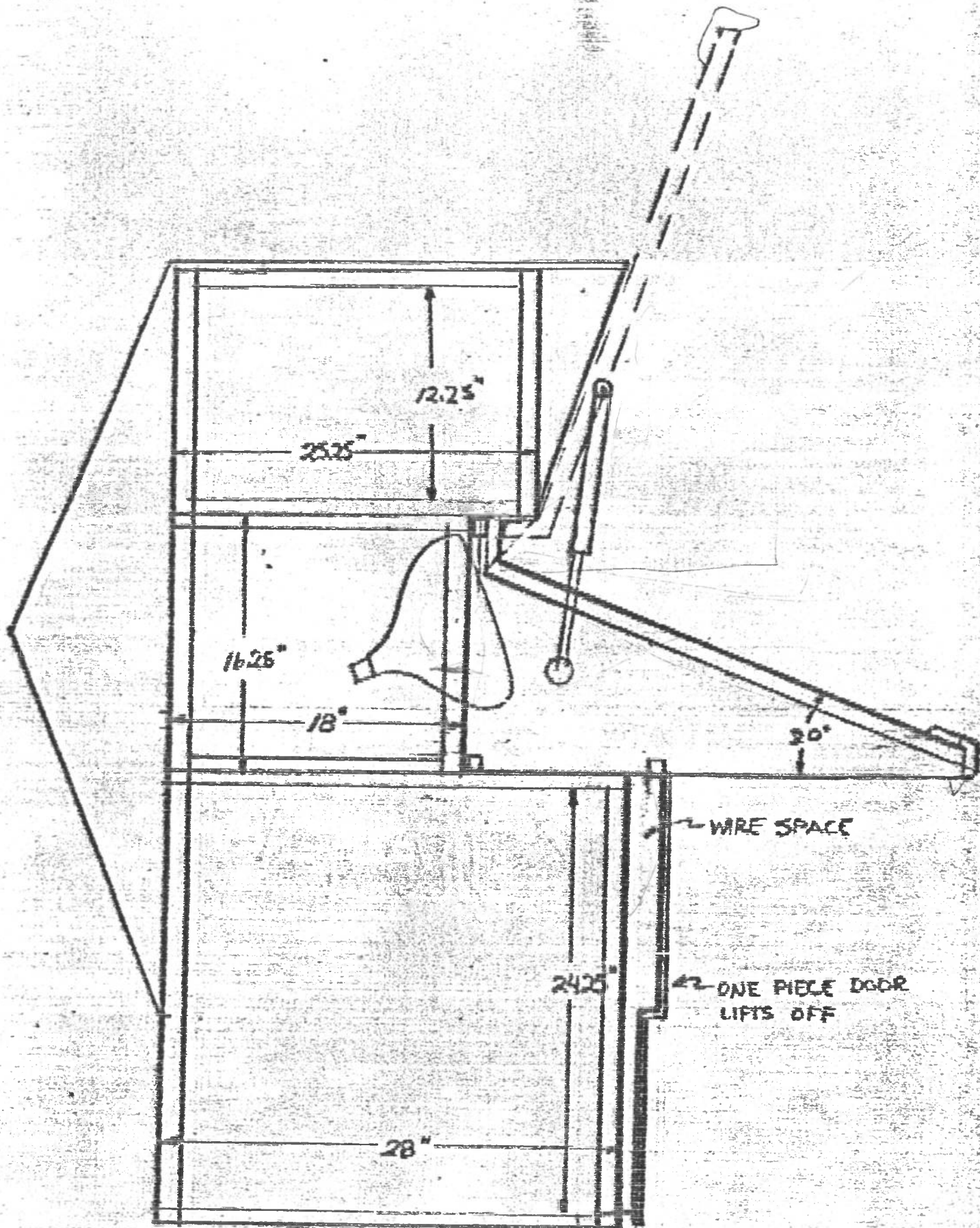
← Level Adjust  
 + + + + +  
 = 0  
 CAPACITOR B G L  
 A B  
 0 0 0 0 0 0  
 Mode Select  
 ON  
 OFF

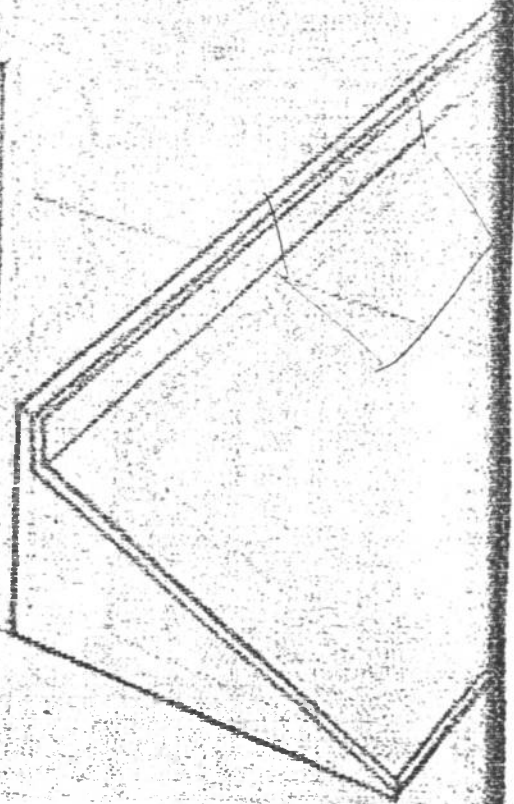
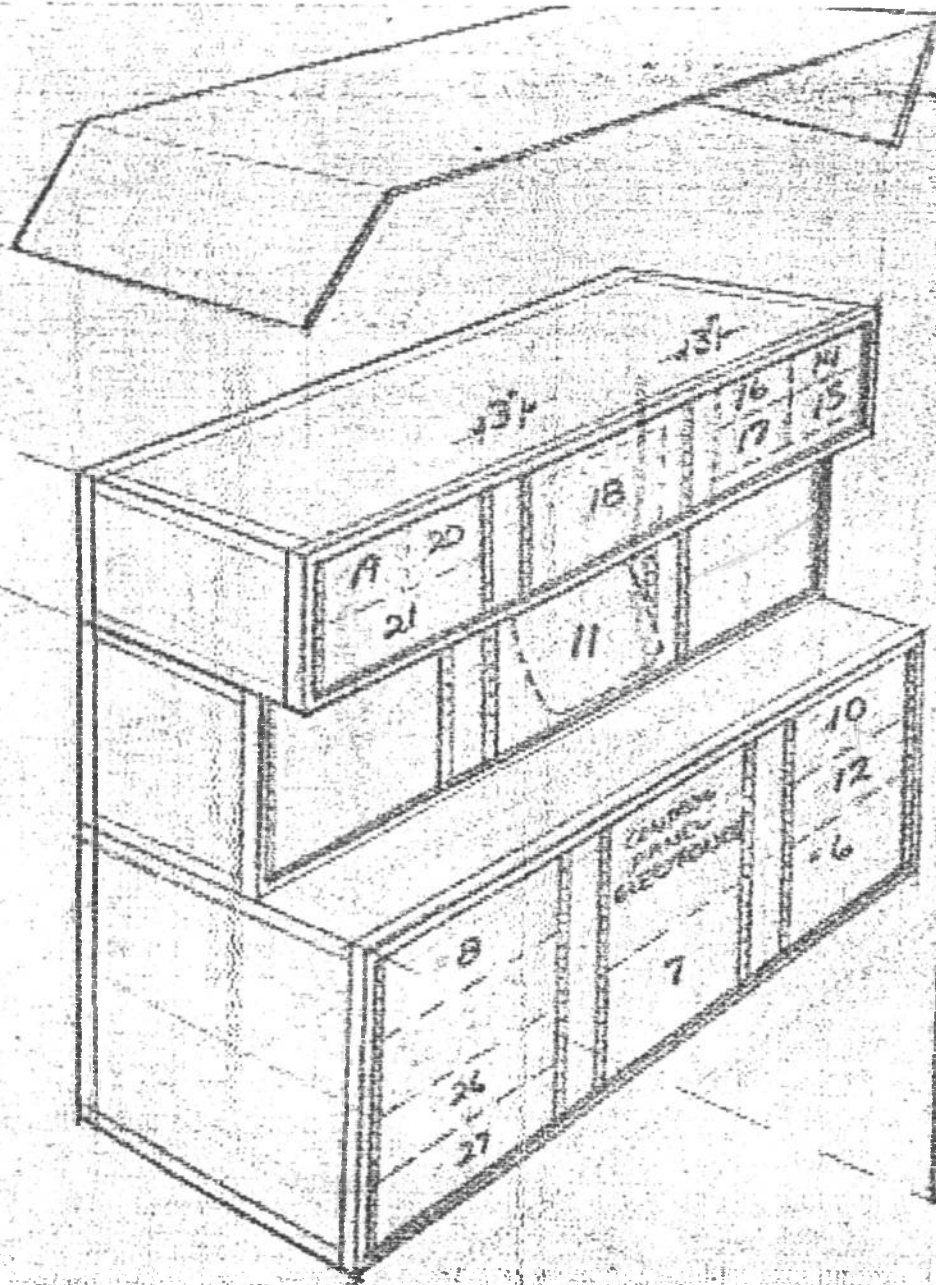
8 slide pots one drop in  
 2 5 pos rotary switches  
 1 6 pos rotary switch  
 6 push button switches  
 overlap control  
 1 rotary pot for adjust



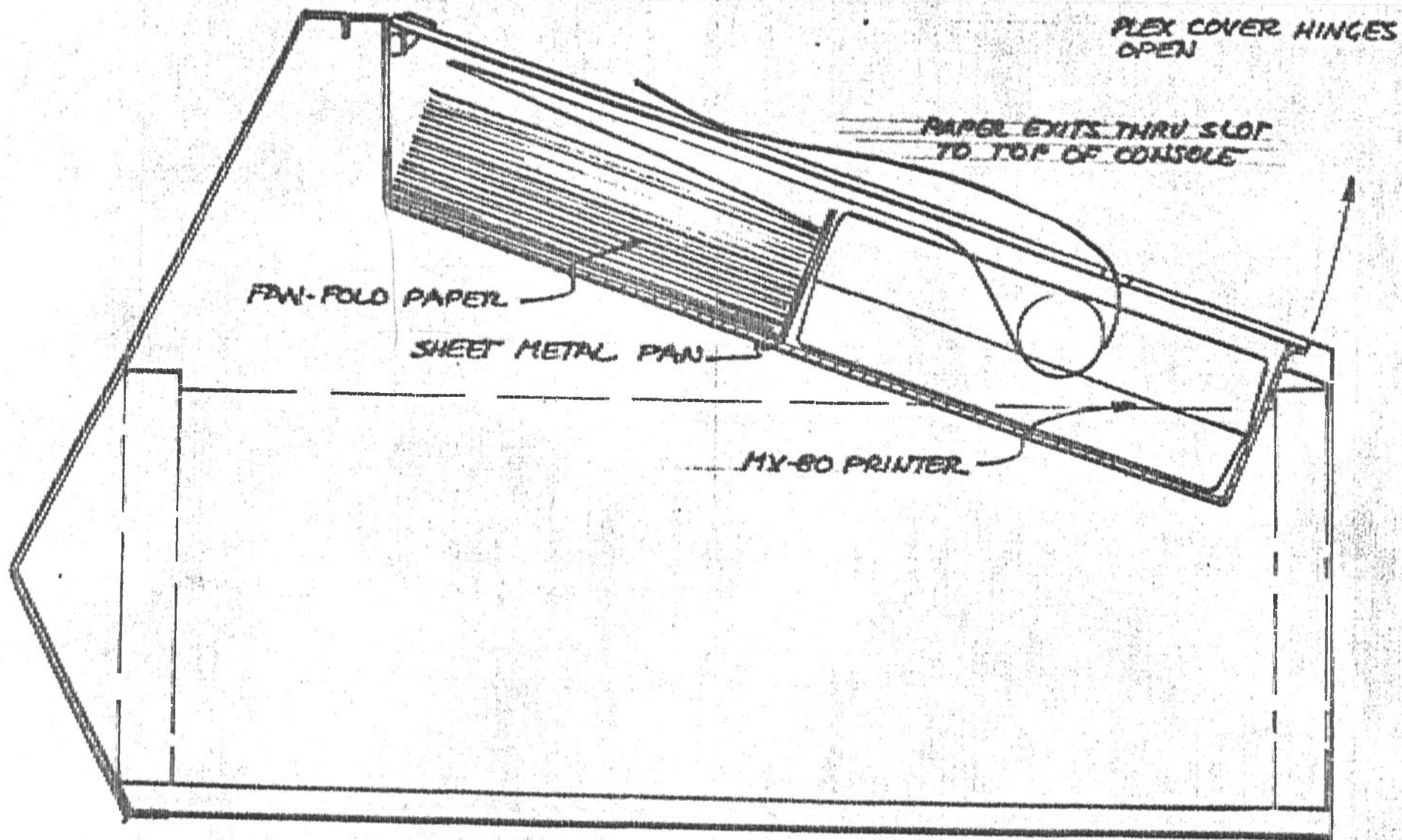
4 slide pots  
 3 rotary pots  
 3 toggle switches  
 4 push button switches









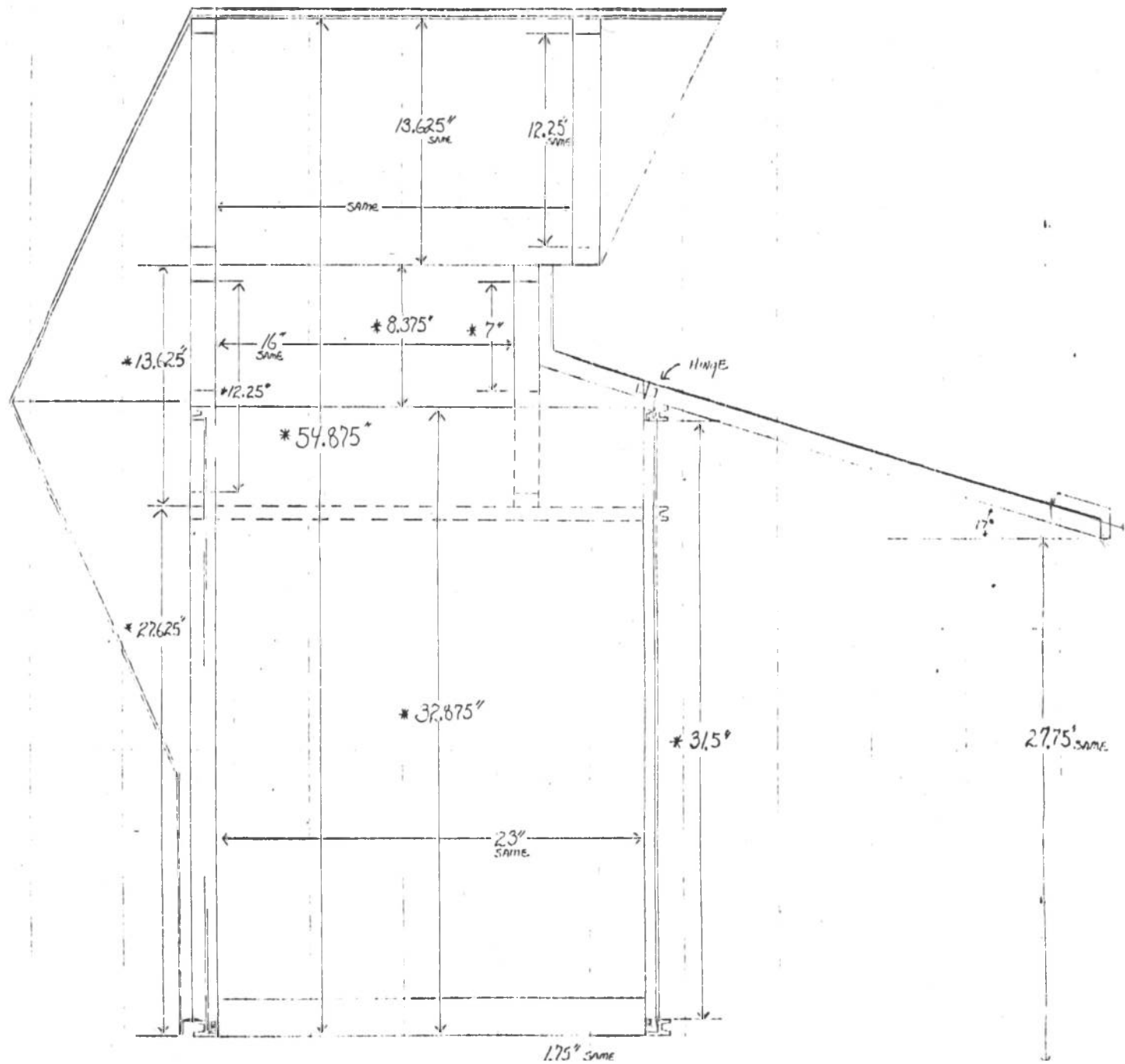


10/28/80



Control of  $z$  modes for blanking  
" " initial conditions for the  $z$  modes

\* NEW DIMENSIONS



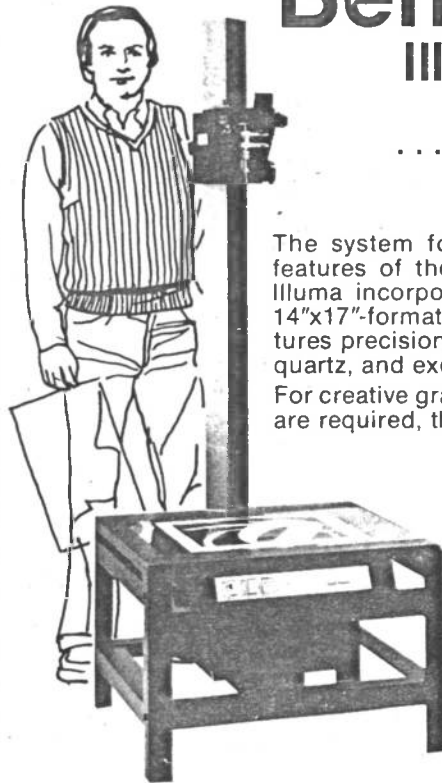
Benchner "Luma stand"

Meas

the

# Benchner M/M Illuma System

...it's the last camera stand you'll ever need!



The system for the tough jobs. Offering all the features of the Benchner M/M Camera Stand, the Illuma incorporates added flexibility with the new 14"x17"-format base illuminator. The illuminator features precision color balance in choice of strobe or quartz, and exceptionally even lighting.

For creative graphics where slide making and visuals are required, the Illuma System is unexcelled.

Camera stands from \$200.

System shown \$720 less camera.

The features that make the Illuma ideal for the creative worker also make the Illuma perfect for analytic, technical, scientific or medical photography.

Available accessories include

Camera Quick Release, Polarizing Light Filter Kit, Copy Mask Set, Slide Duplicator, Special counterbalance springs (for heavy cameras)

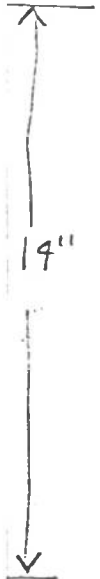
Send for free brochure

BENCHNER, INC.

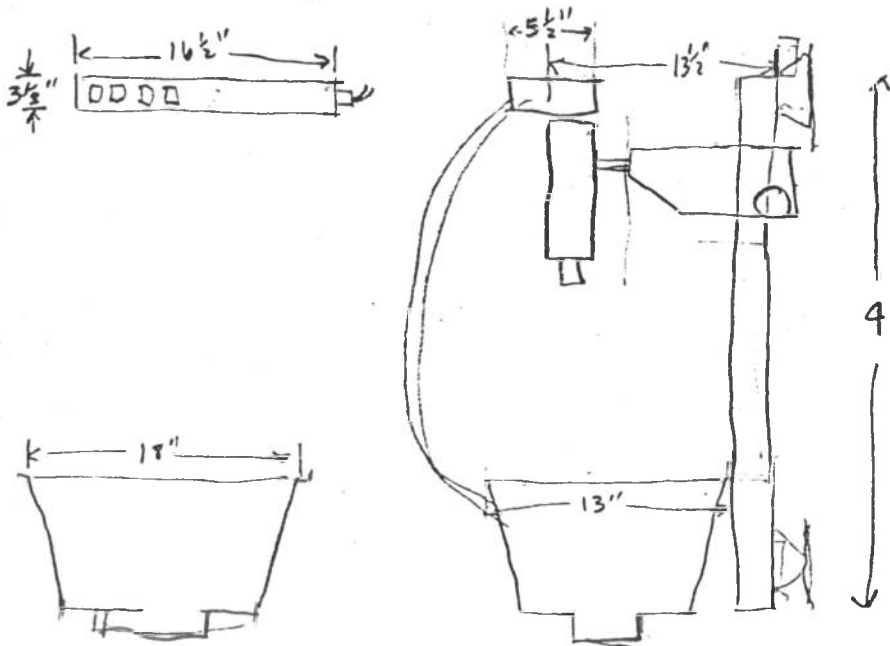
333 W. Lake St., Chicago, IL 60606 • (312) 263-1808

FOR INFORMATION, CIRCLE 441 ON POST CARD

FEBRUARY 1980/39

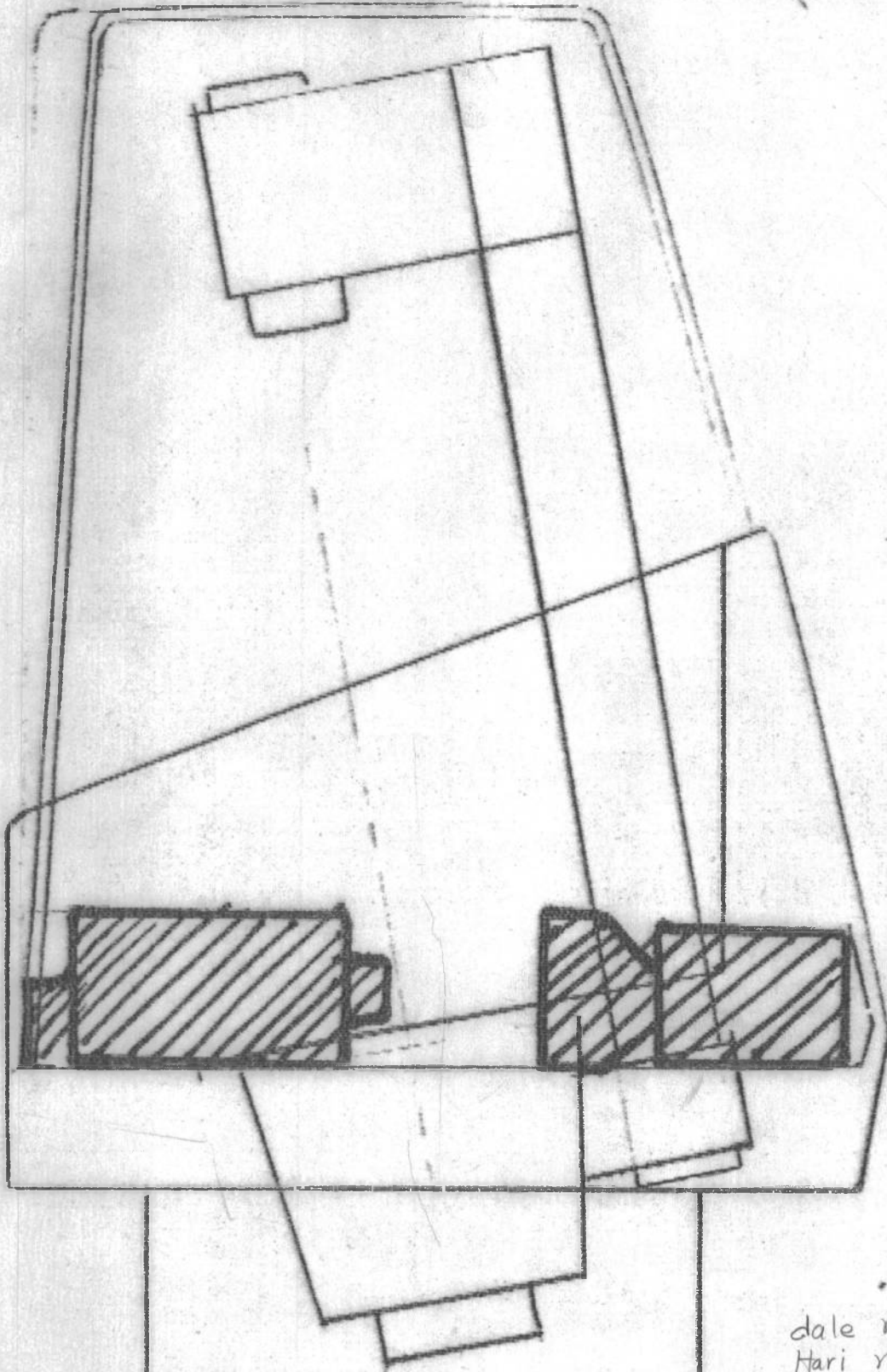


The light measured on two different CI light boxes was 17.5 on one and 18.5 on another - measured at the center



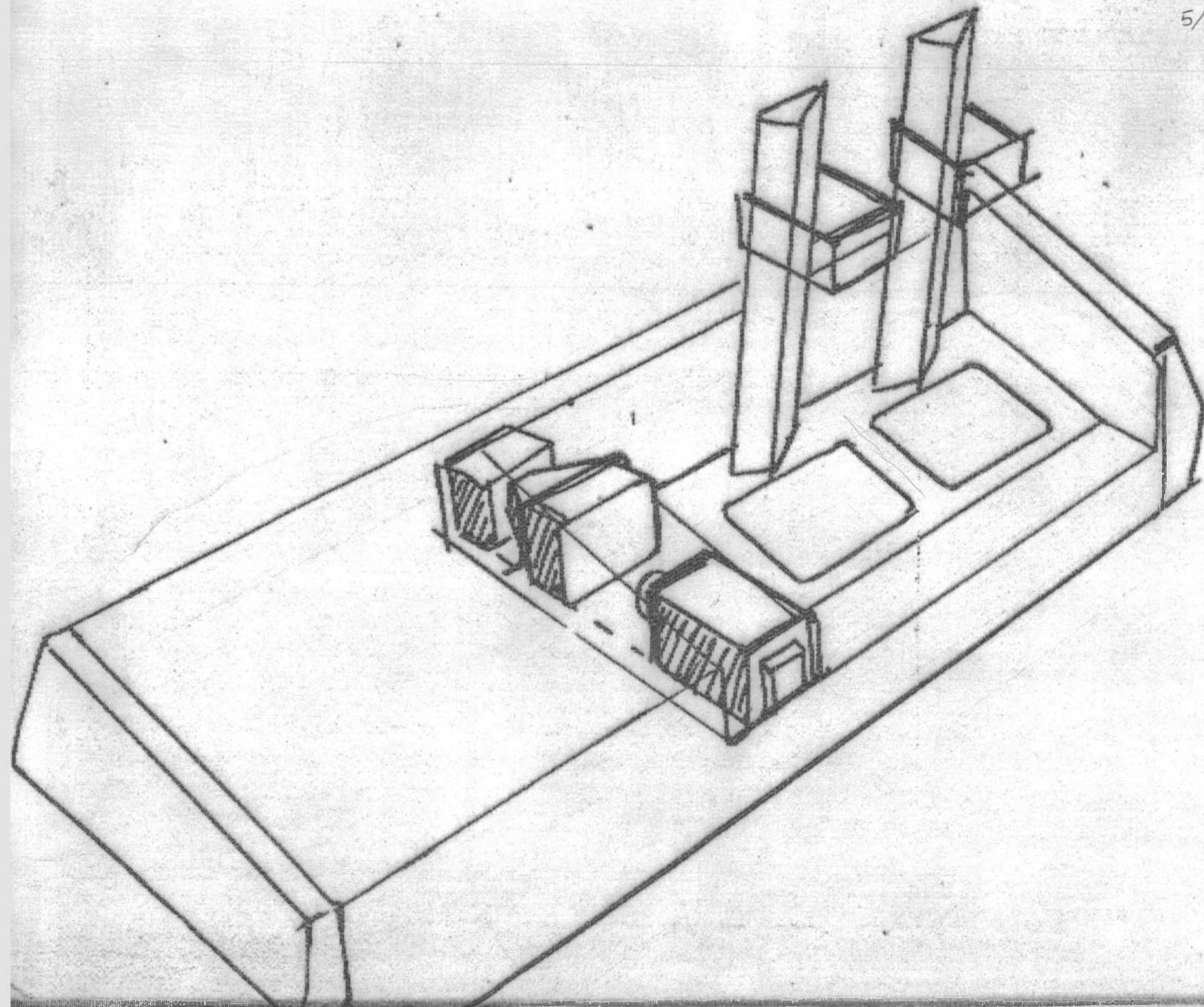
Art work  
Units #142





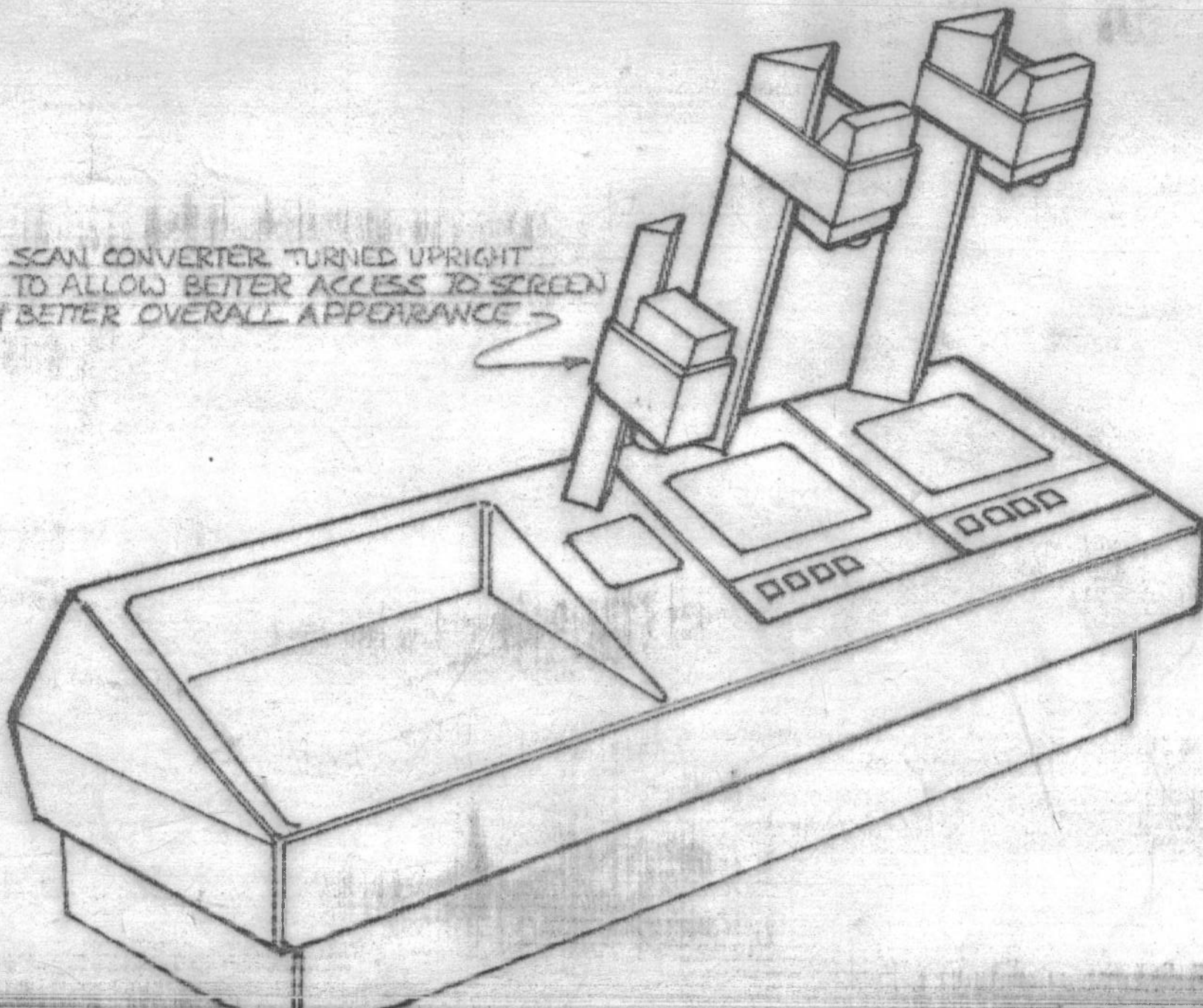
dale murray  
Hari matusda

5/1/80

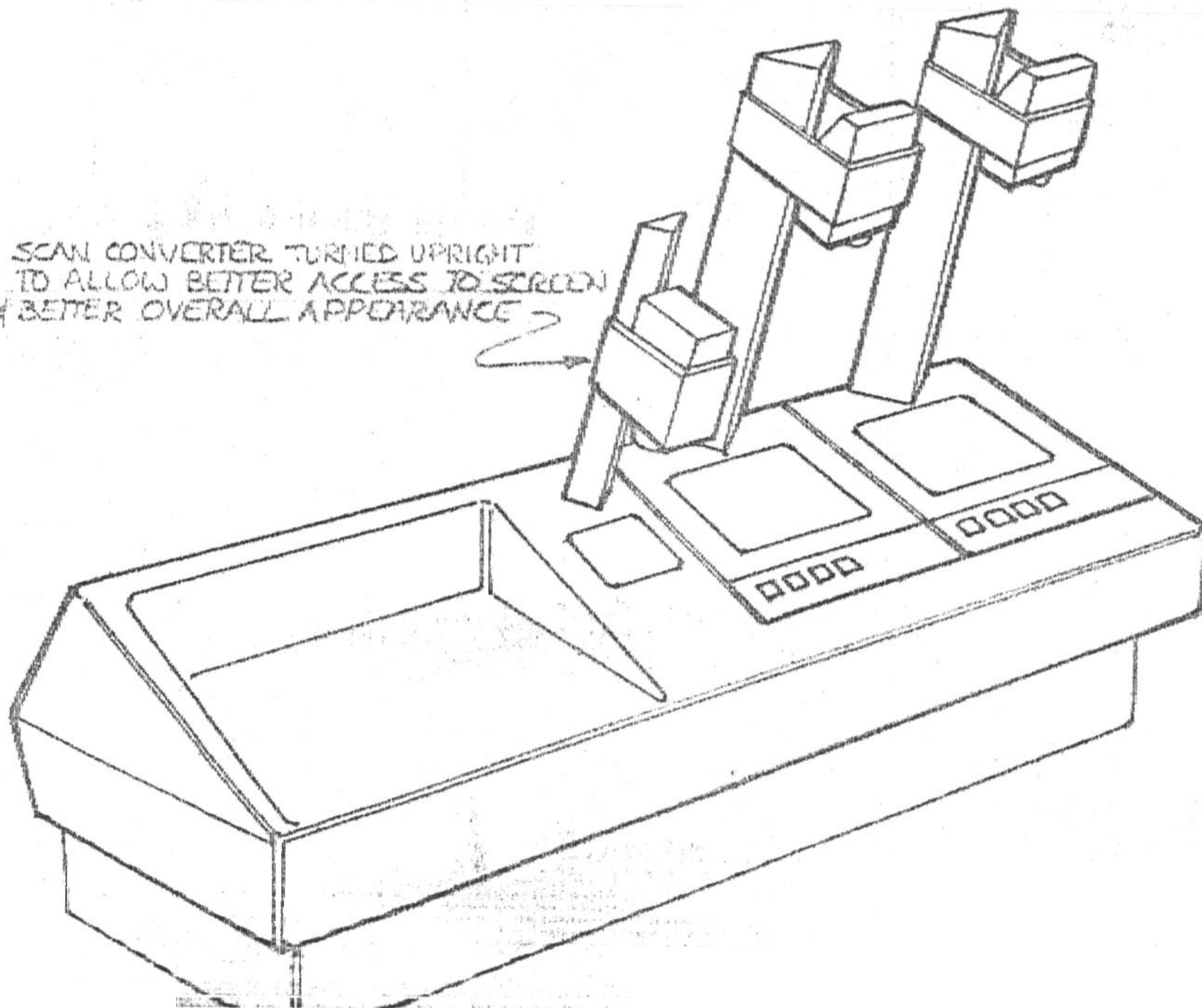




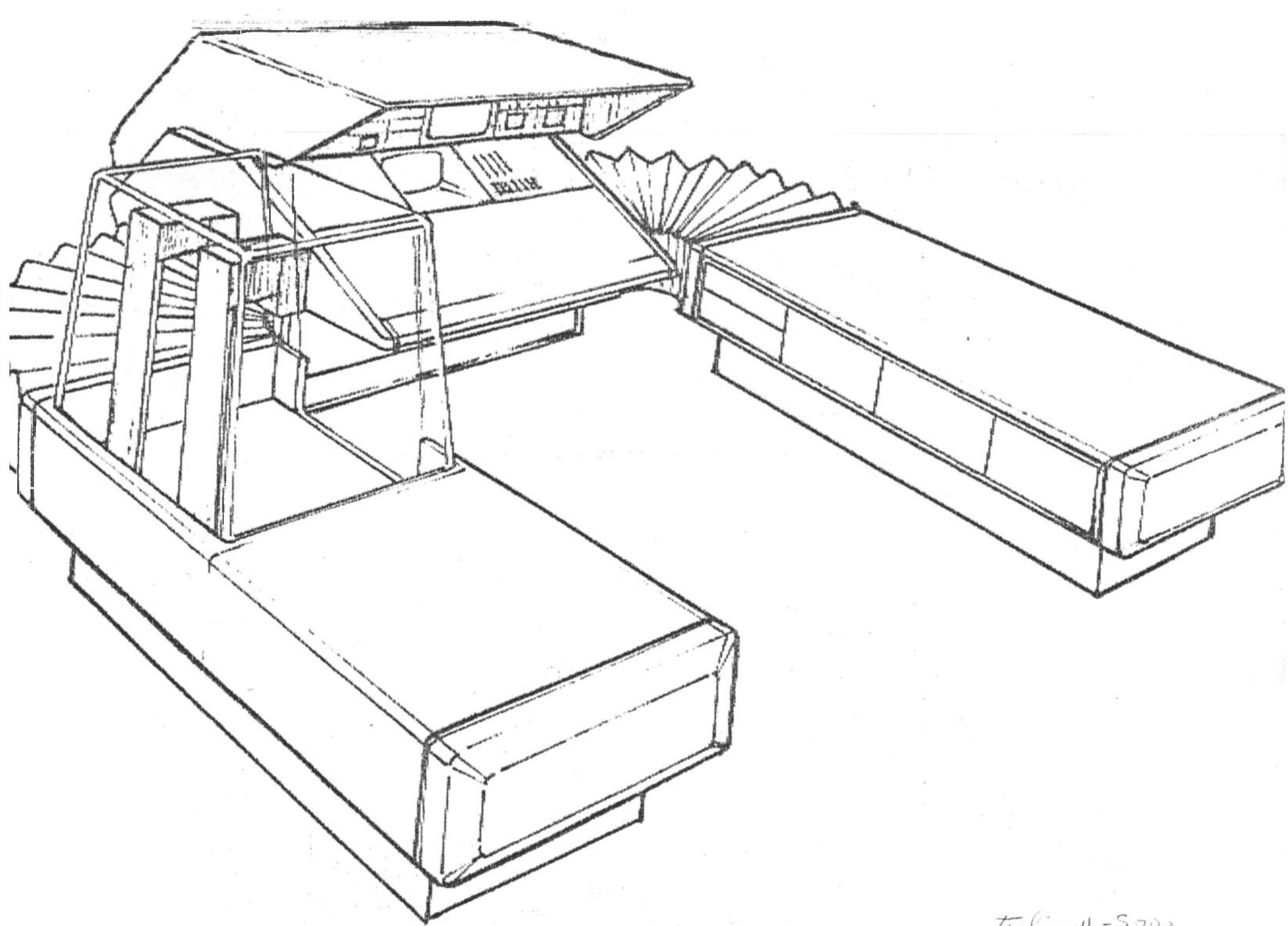
SCAN CONVERTER TURNED UPRIGHT  
TO ALLOW BETTER ACCESS TO SCREEN  
& BETTER OVERALL APPEARANCE



SCAN CONVERTER TURNED UPRIGHT  
TO ALLOW BETTER ACCESS TO SCREEN  
& BETTER OVERALL APPEARANCE







tooling 4-5000  
per unit - 1500

4/8/80

## Areas for investigation in SIV packaging

1) Are the right boxes close together?  
Test Oscilloscope next to 2 input camera controls which are side by side

→ 2) Cooling air requirements - fans, air intake & exhaust

3) Will all of the controls be reachable - long way from edge of control panel to some equipment knobs.

4) Slanting artwork surface may require different operating procedures  
accessability to work on artwork

= 5) Ease of adjusting camera height, center, focus

6) Input artwork camera controls come two, side by side

Scan Converter camera control comes one in a 19" rack

Overlap camera control comes in a  $5\frac{1}{4}" \times 19"$  space

— 7) Need maintenance accessability for RPU, OSC, Input Video Processor  
Scan converter

8) Need test scope  $[5\frac{1}{4}" \times 19" \times 19"]$

Two loto box controls  $[18" \times 5\frac{1}{2}" \times 3\frac{1}{8}"$

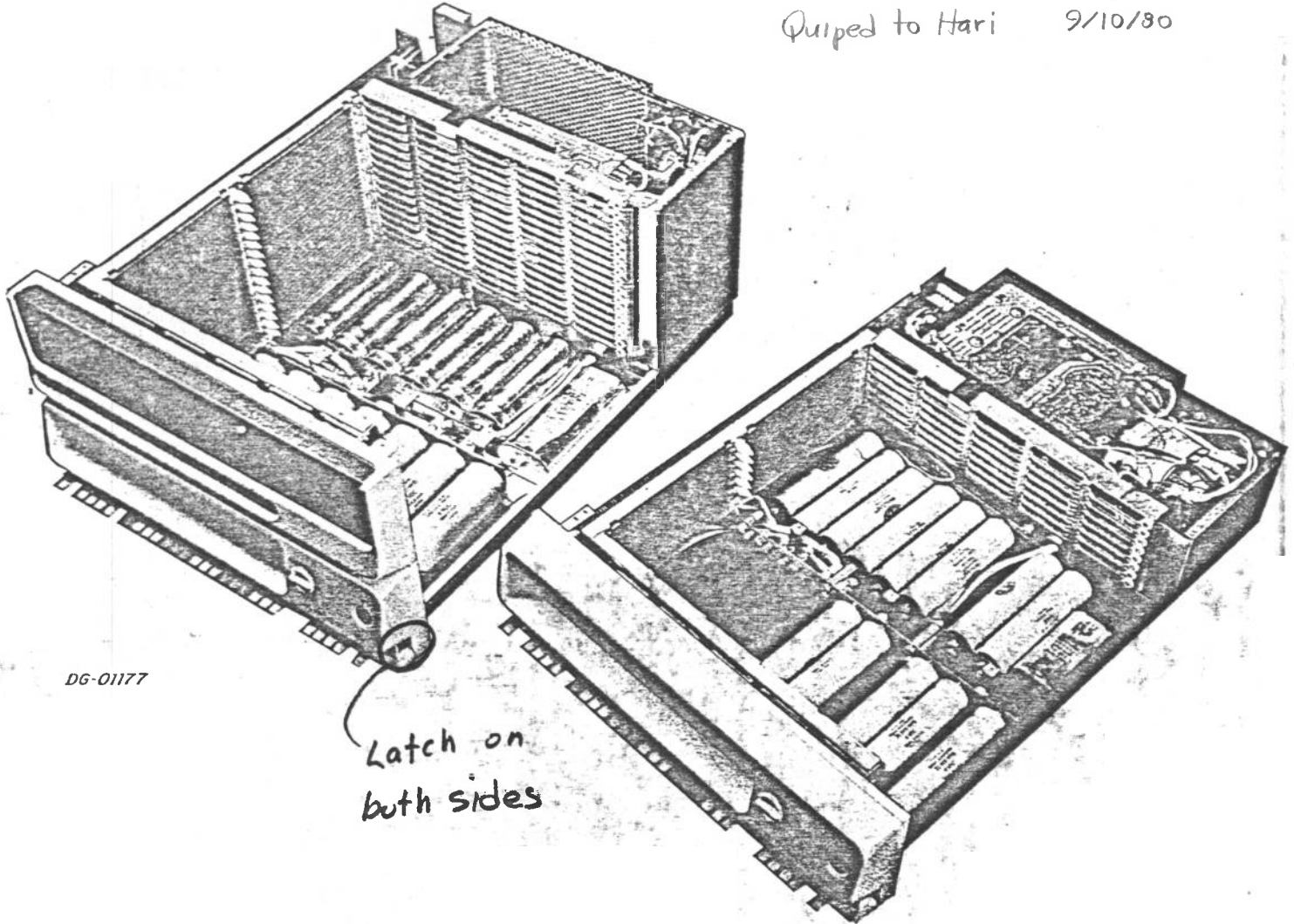
Power supplies for Deflection Amp & Hi Voltage Supplies

Two 48 volt supplies  $[9\frac{3}{4}" \times 5\frac{1}{4}" \times 19"]$

One drawer of assorted supplies  $[5\frac{1}{4}" \times 19" \times 19"]$

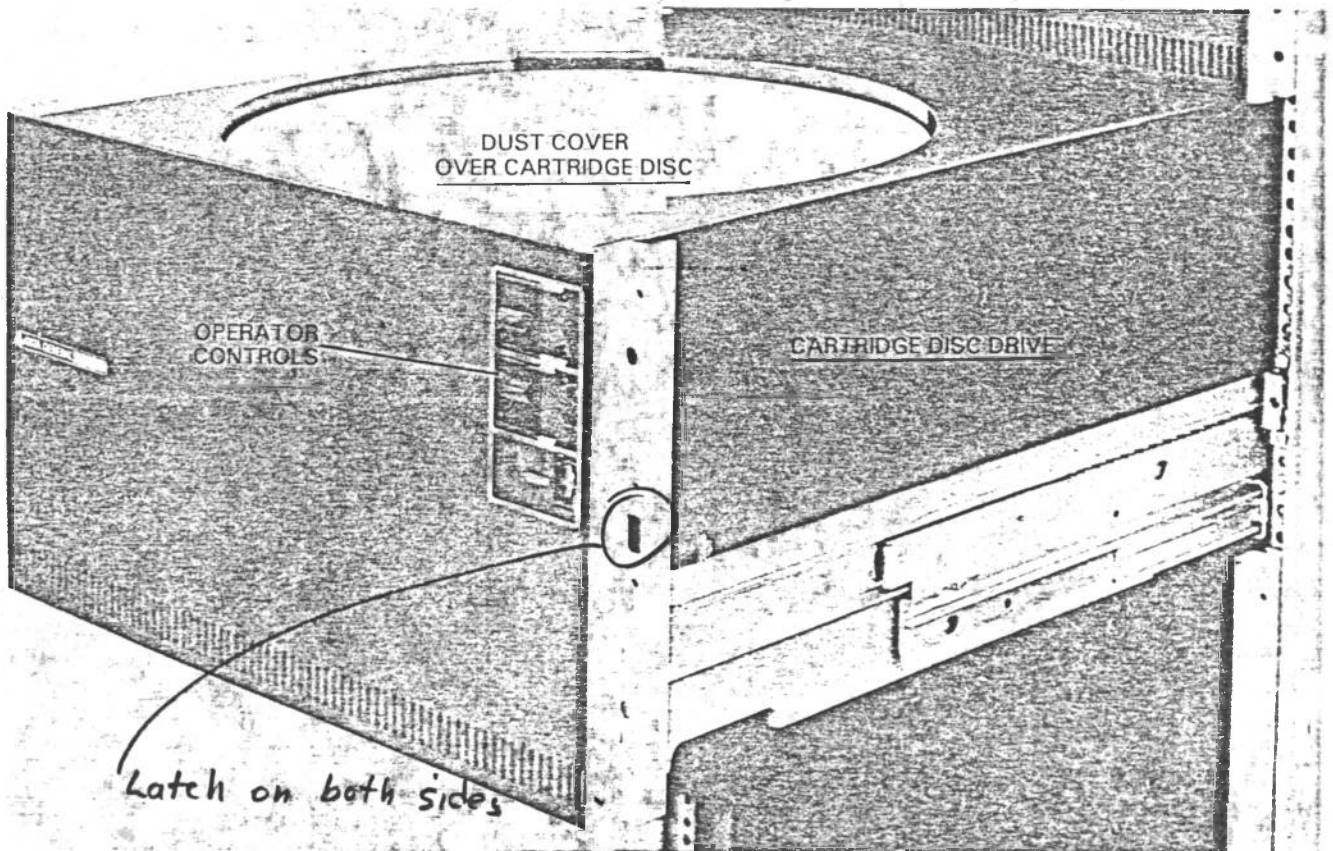
Input Video or Change Controls



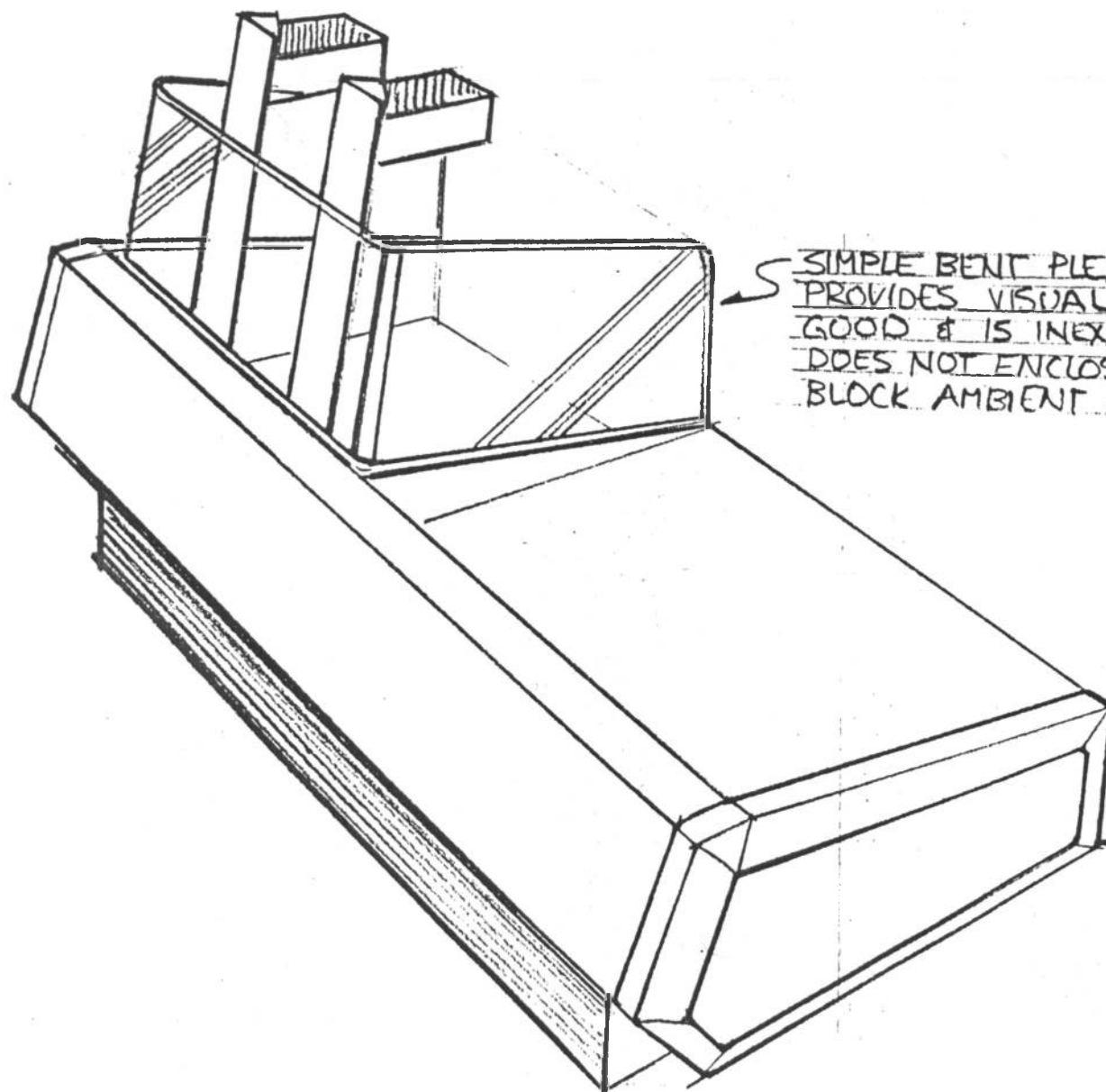


DG-01177

VIEWS OF CHASSIS AND POWER SUPPLIES



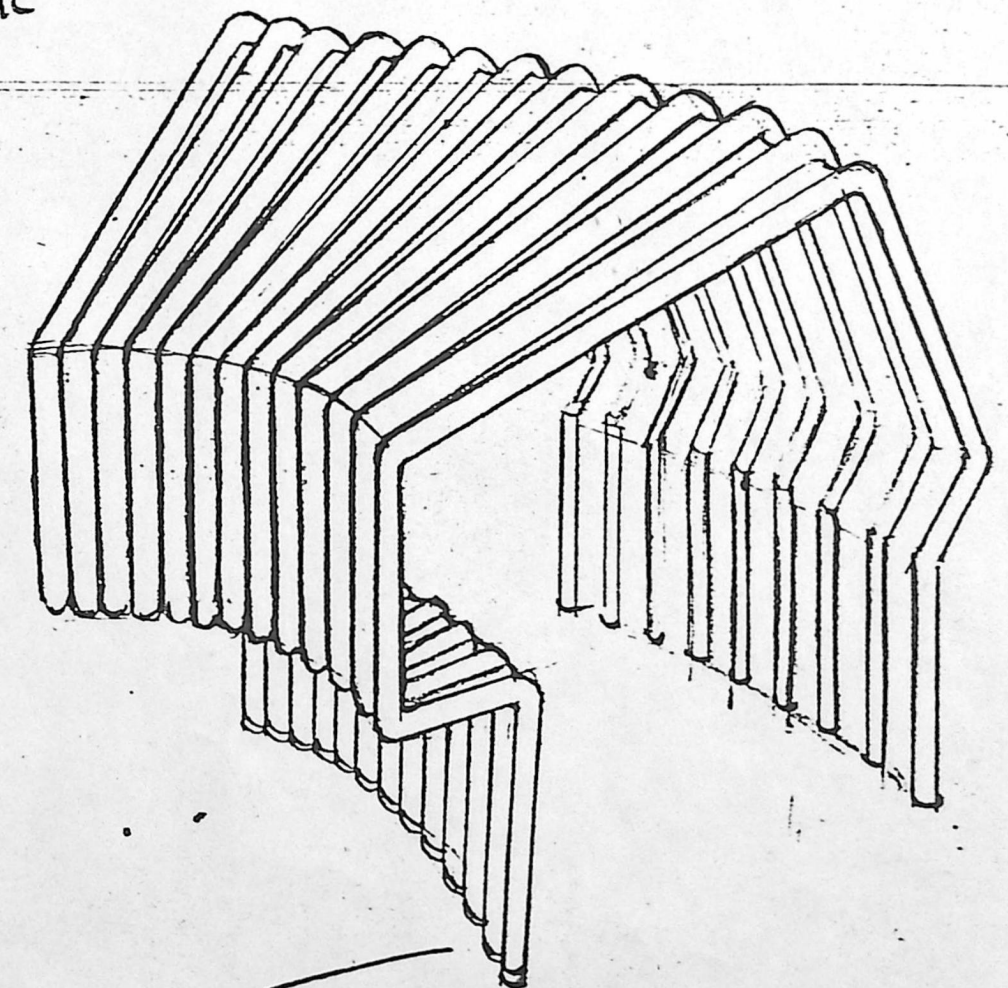
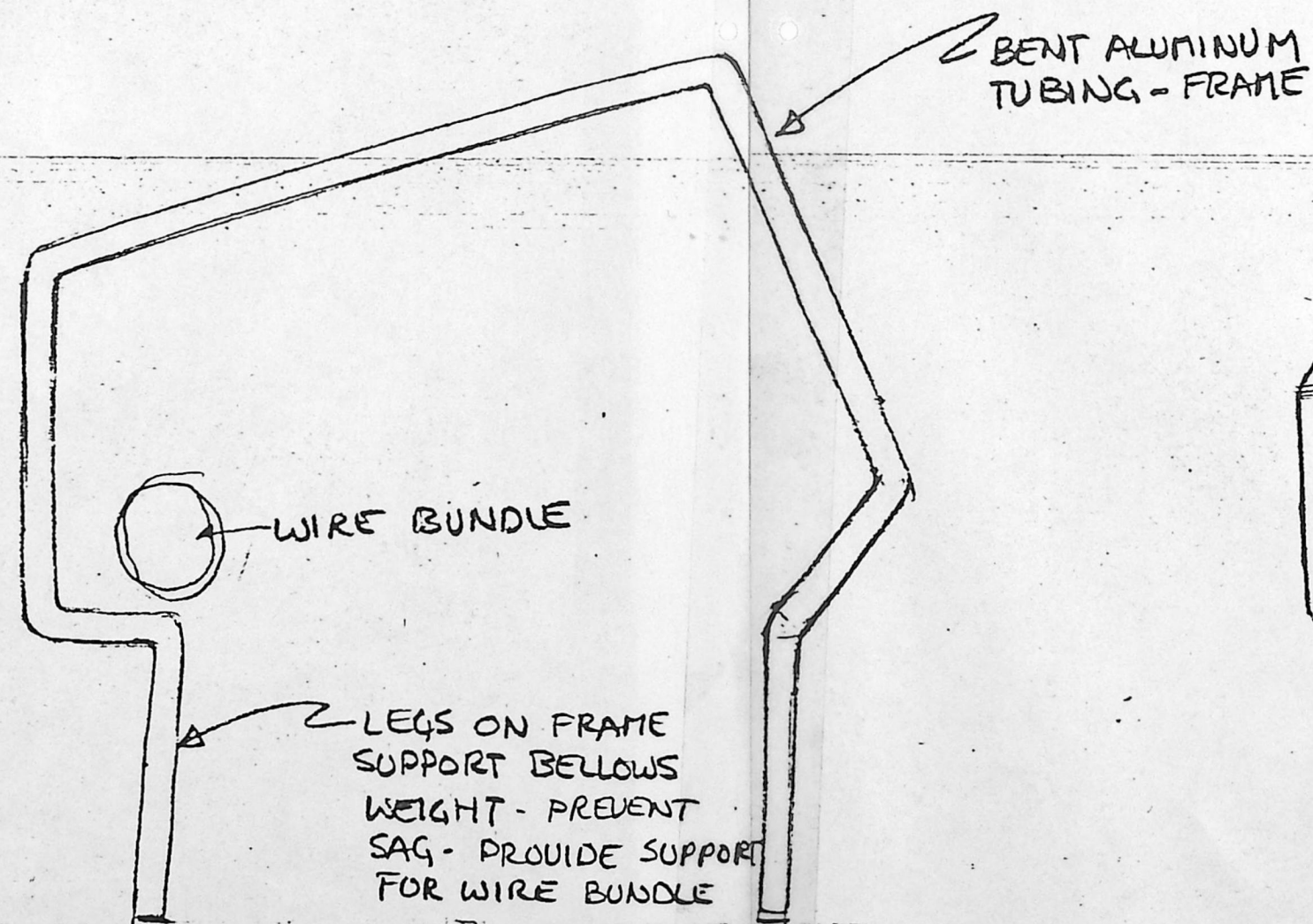
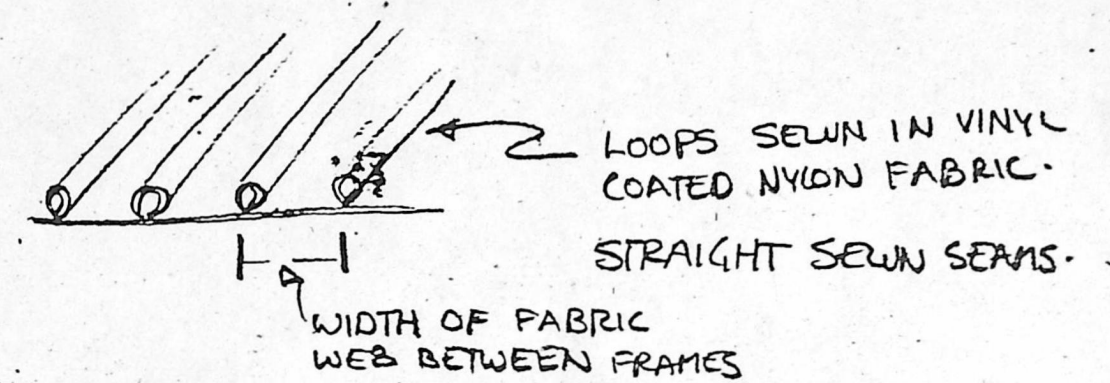




← SIMPLE BENT PLEX DUST COVER  
PROVIDES VISUAL BARRIER, LOOKS  
GOOD & IS INEXPENSIVE. BUT  
DOES NOT ENCLOSE SPACE OR  
BLOCK AMBIENT LIGHT.

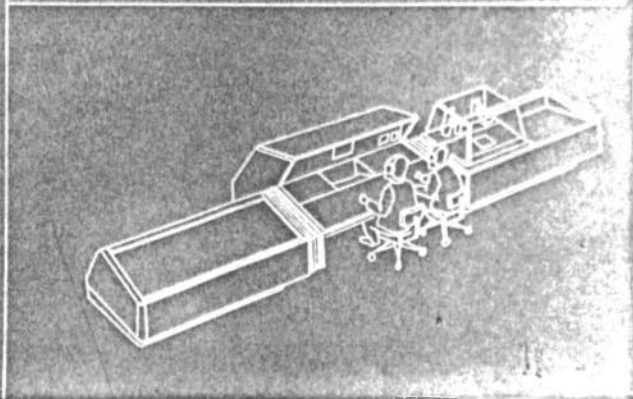
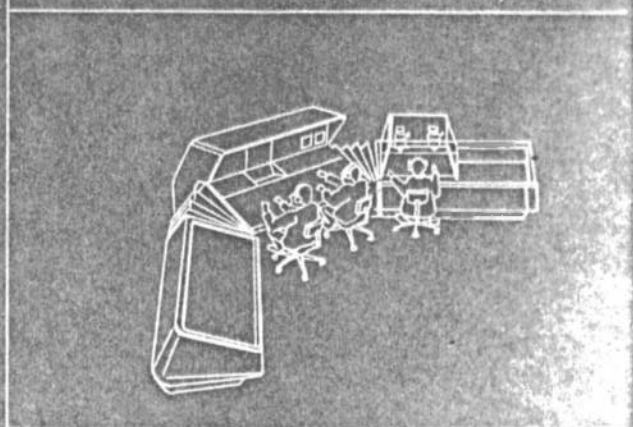
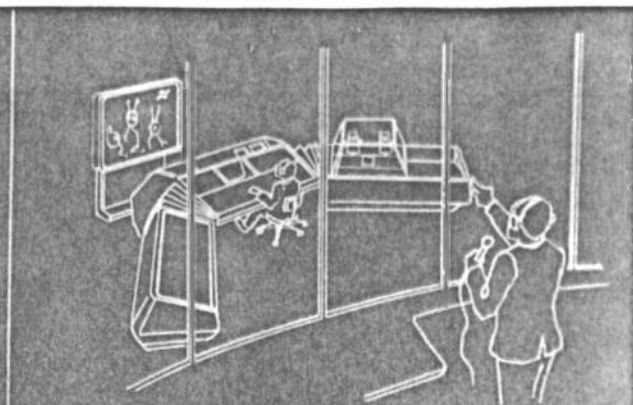
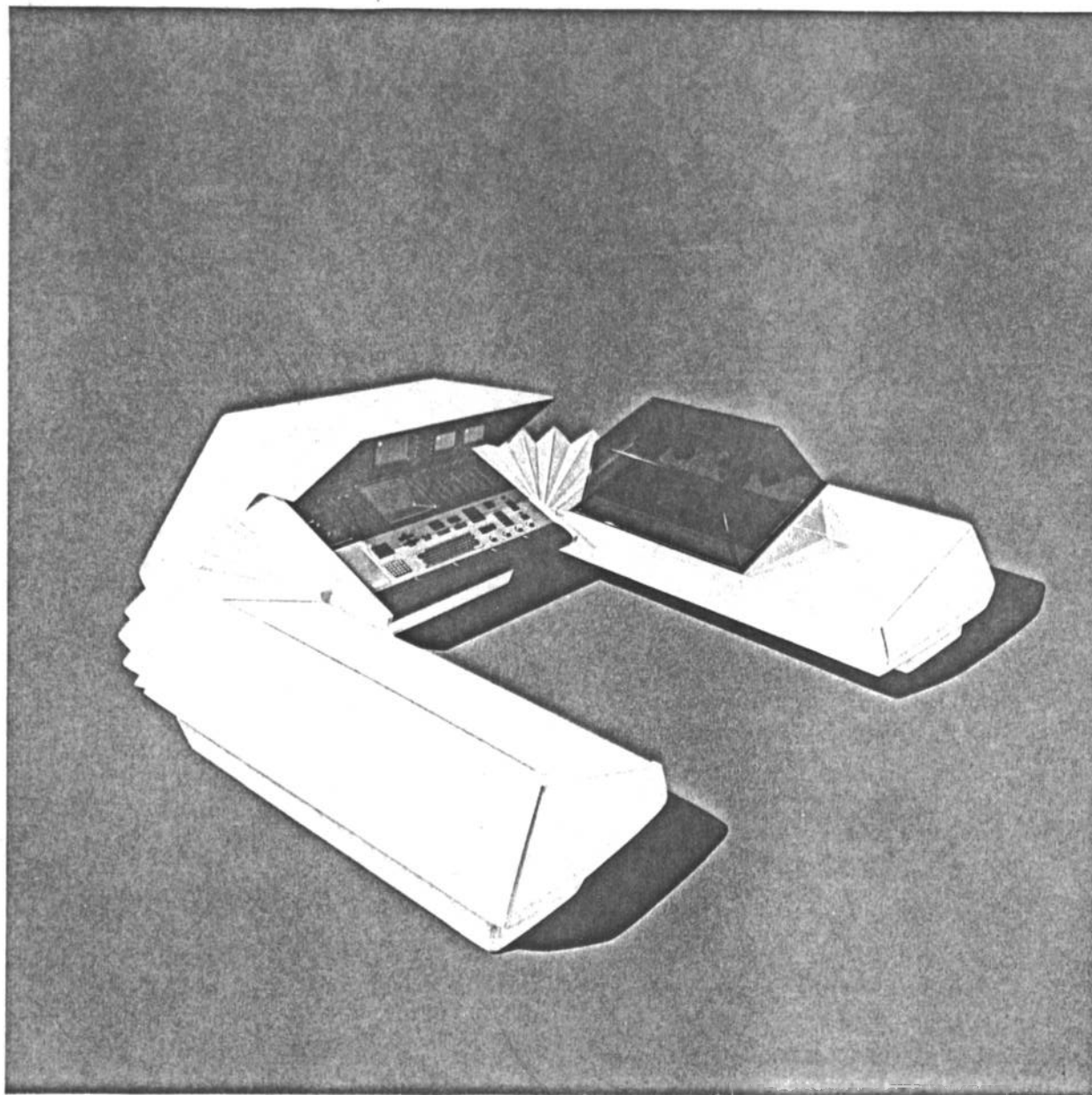
← NOTE: END CAPS REDESIGNED  
SO ONLY 2 TOOLS - (RIGHT & LEFT)  
ARE REQUIRED

# PROPOSED BELLOWS SOLUTION

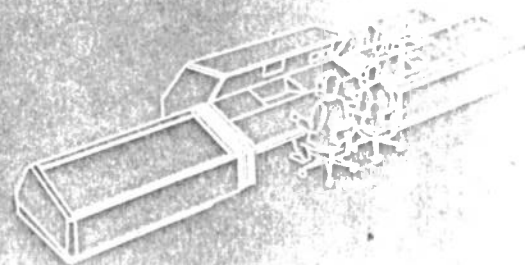
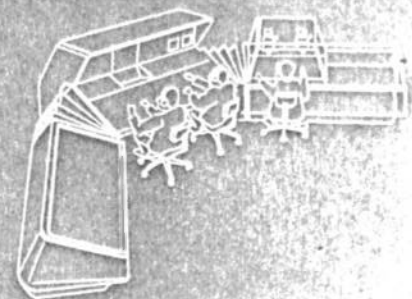
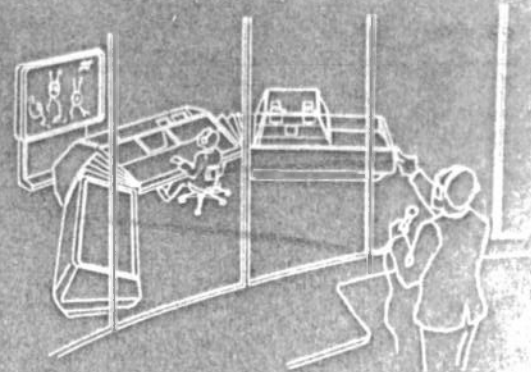
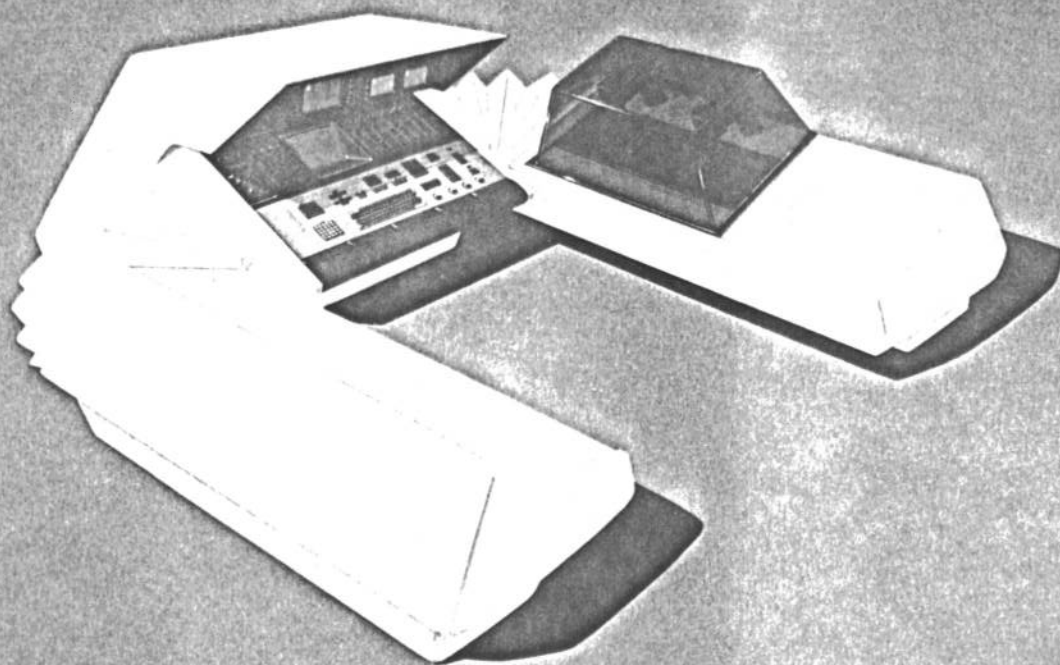


18 PIECES TOTAL



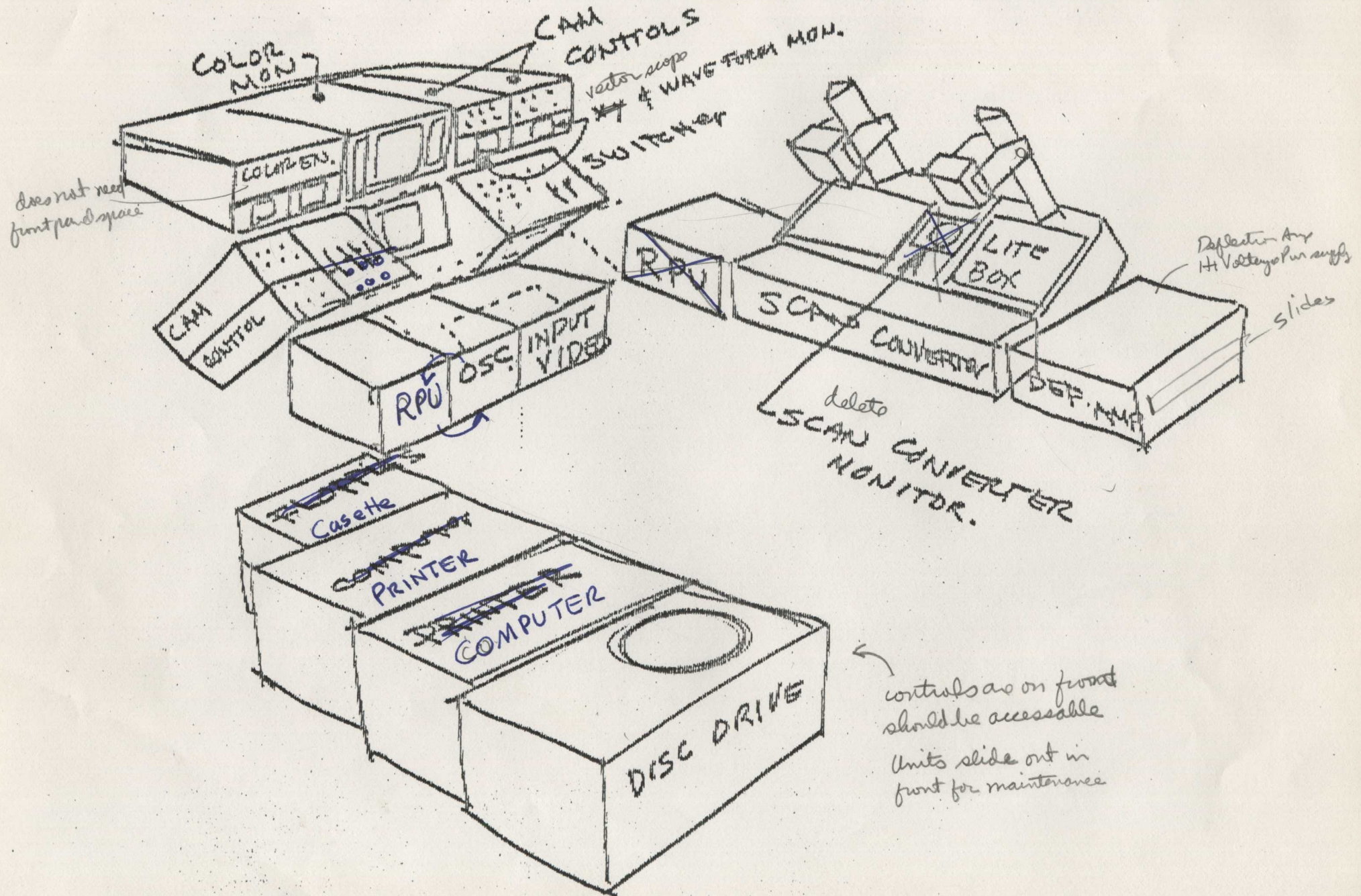


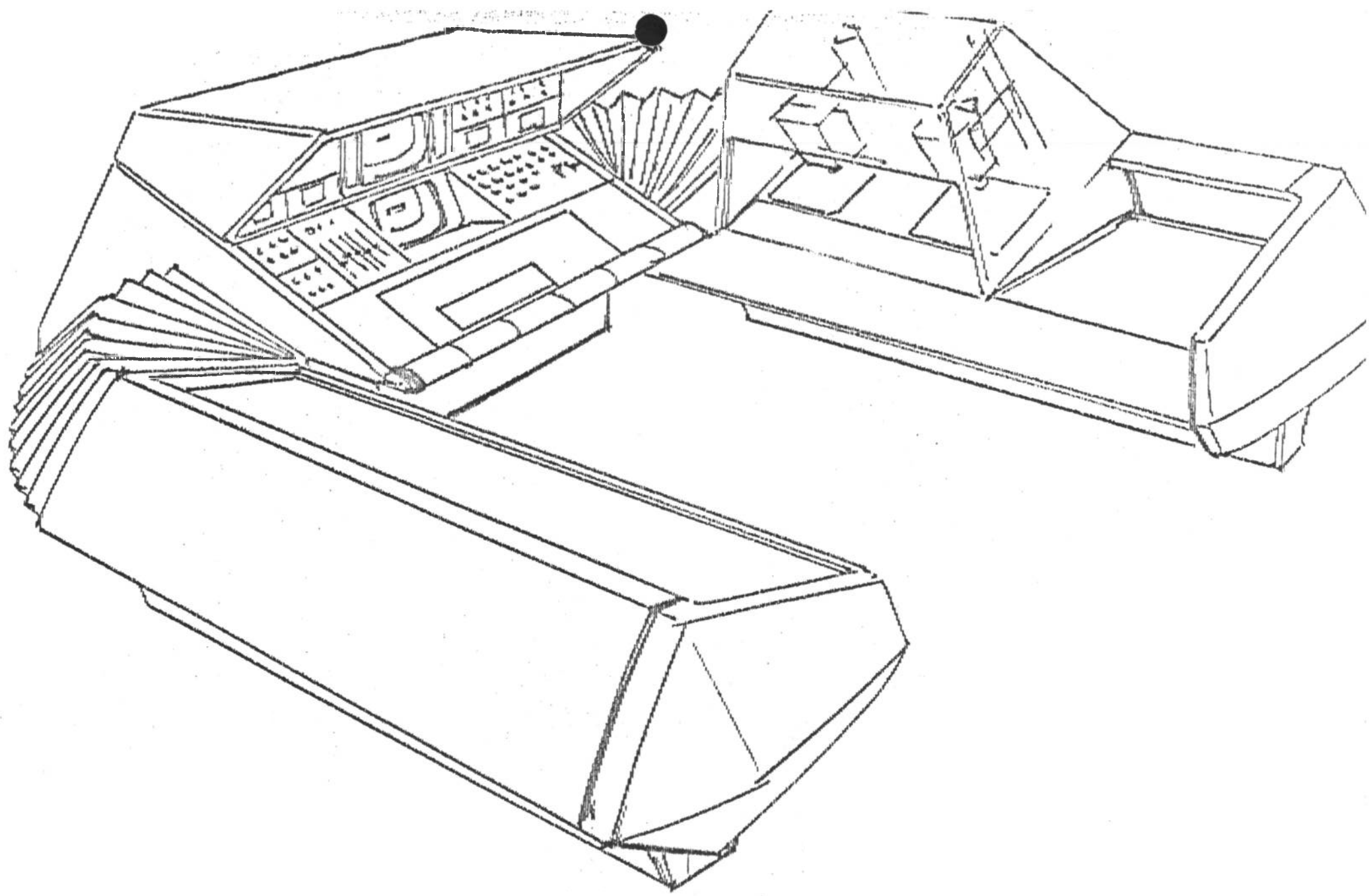




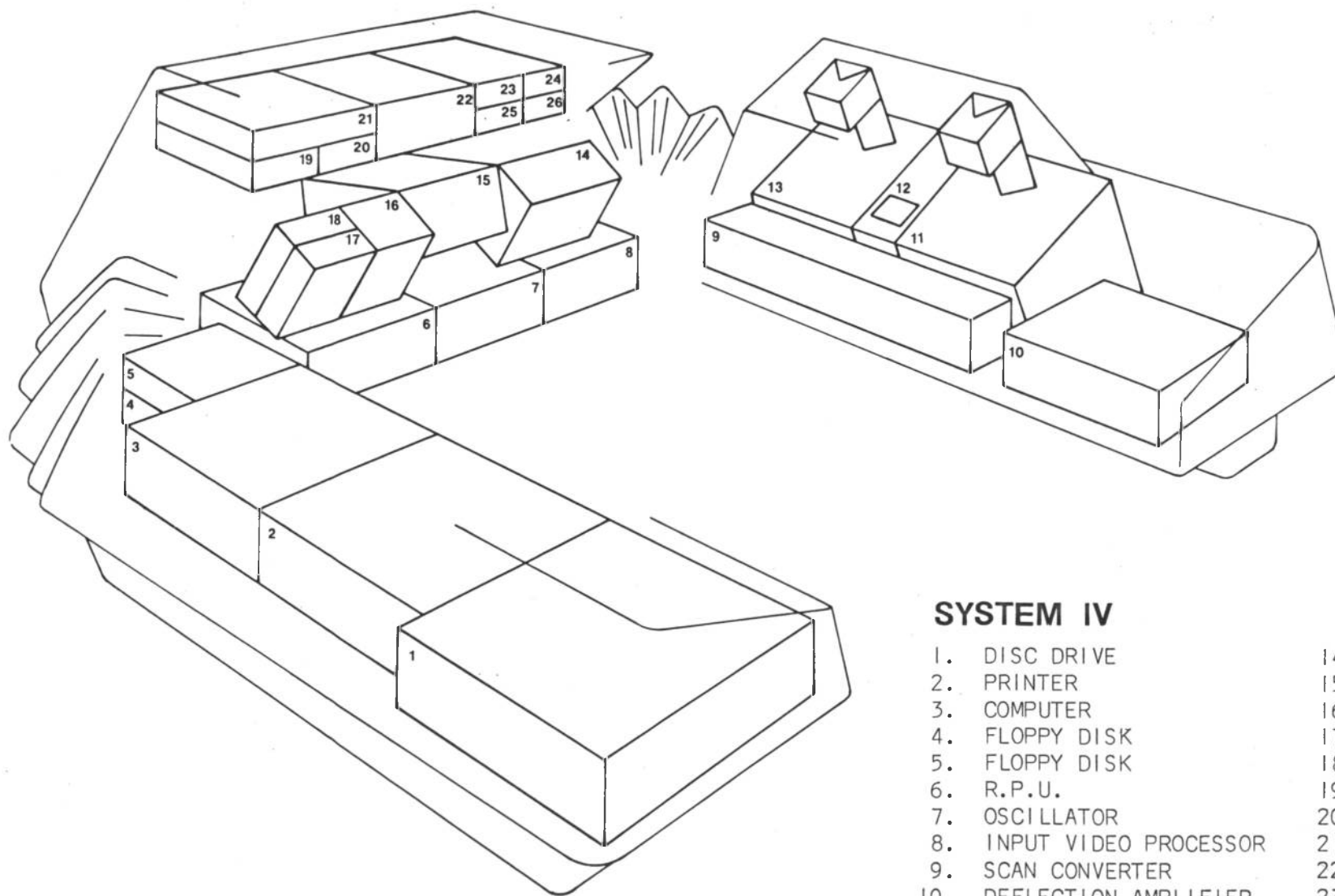


Can we combine the X-Y scope with the ~~an~~ converter camera control in the same 5 1/4 x 19" rack space?





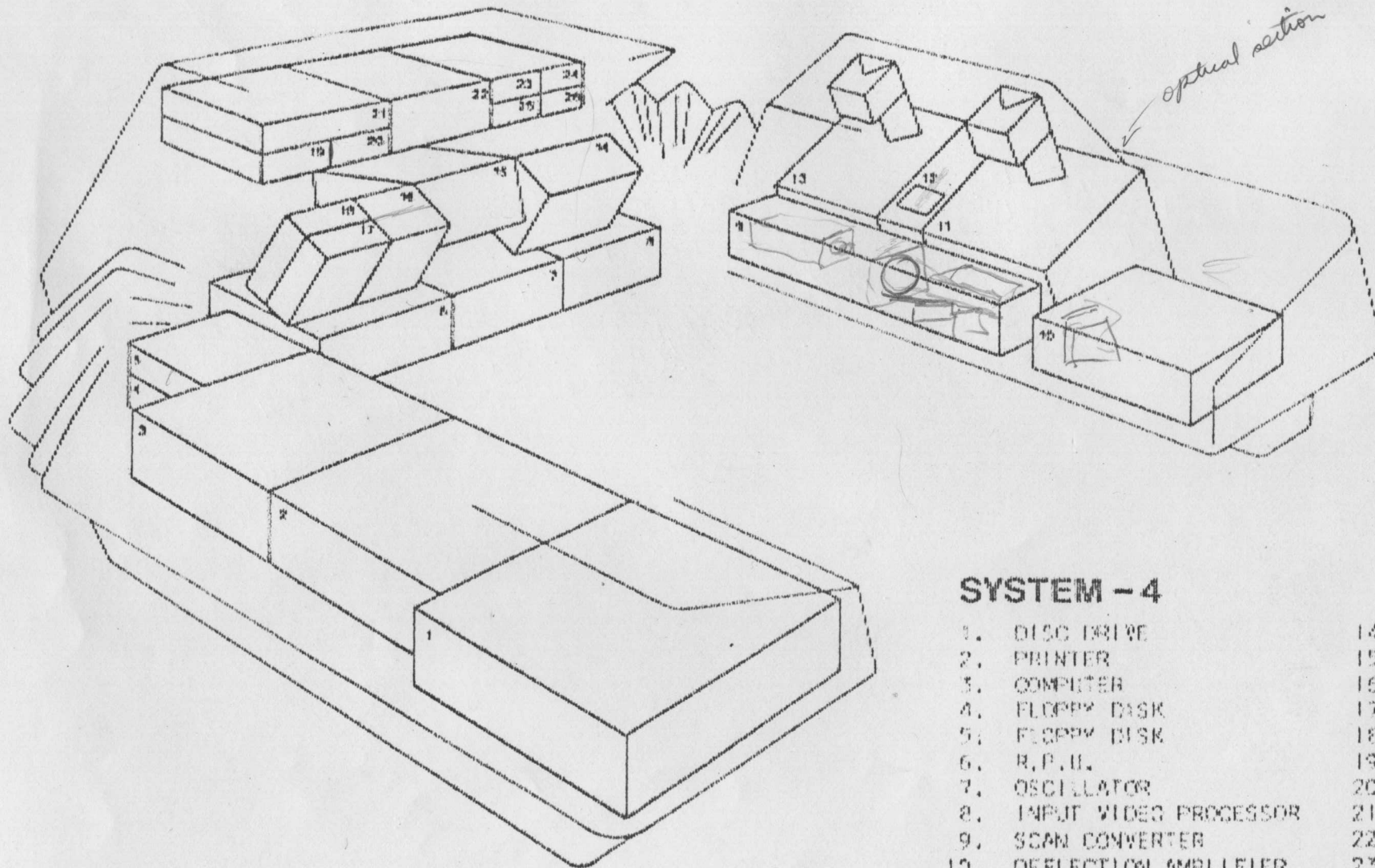




## SYSTEM IV

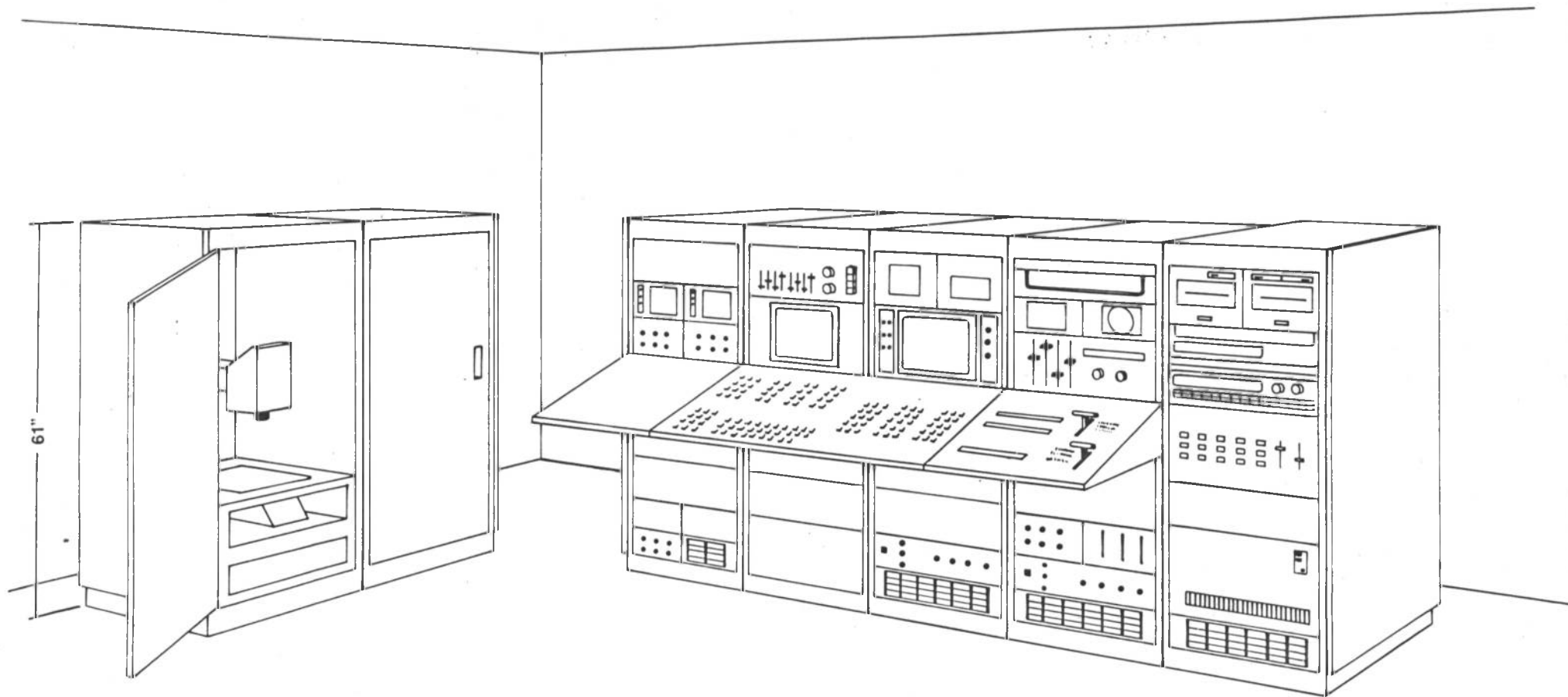
- |                            |                       |
|----------------------------|-----------------------|
| 1. DISC DRIVE              | 14. SWITCHER          |
| 2. PRINTER                 | 15. TERMINAL          |
| 3. COMPUTER                | 16. COLOR CONTROLLER  |
| 4. FLOPPY DISK             | 17. CAMERA CONTROL    |
| 5. FLOPPY DISK             | 18. CAMERA CONTROL    |
| 6. R.P.U.                  | 19. XY MONITOR        |
| 7. OSCILLATOR              | 20. TEST SCOPE        |
| 8. INPUT VIDEO PROCESSOR   | 21. COLOR ENCODER     |
| 9. SCAN CONVERTER          | 22. COLOR MONITOR     |
| 10. DEFLECTION AMPLIFIER   | 23. CAMERA CONTROL    |
| 11. LITE BOX               | 24. CAMERA CONTROL    |
| 12. SCAN CONVERTER MONITOR | 25. VECTOR MONITOR    |
| 13. LITE BOX               | 26. WAVE FORM MONITOR |

camera cables  
 camera video  
 Deflection signals  
 Video  
 Blanking



## SYSTEM - 4

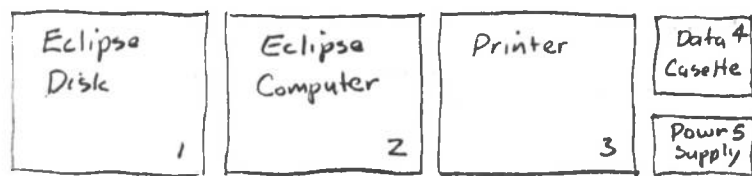
- |                            |                      |
|----------------------------|----------------------|
| 1. DISC DRIVE              | 14. SWITCHER         |
| 2. PRINTER                 | 15. TERMINAL         |
| 3. COMPUTER                | 16. COLOR CONTROLLER |
| 4. FLOPPY DISK             | 17. CAMERA CONTROL   |
| 5. FLOPPY DISK             | 18. CAMERA CONTROL   |
| 6. R.P.U.                  | 19. XY MONITOR       |
| 7. OSCILLATOR              | 20. TEST SCOPE       |
| 8. INPUT VIDEO PROCESSOR   | 21. COLOR ENCODER    |
| 9. SCAN CONVERTER          | 22. COLOR MONITOR    |
| 10. DEFLECTION AMPLIFIER   | 23. CAMERA CONTROL   |
| 11. LITE BOX               | 24. CAMERA CONTROL   |
| 12. SCAN CONVERTER MONITOR | 25. VECTOR MONITOR   |
| 13. LITE BOX               | 26. NAME FORM        |



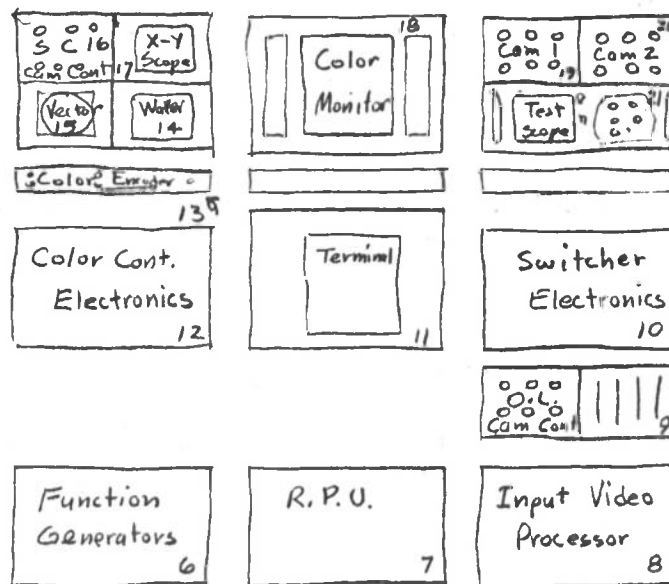
## **SYSTEM IV**

ENGINEERING PROTOTYPE  
COMPUTER IMAGE CORPORATION  
DENVER, COLORADO

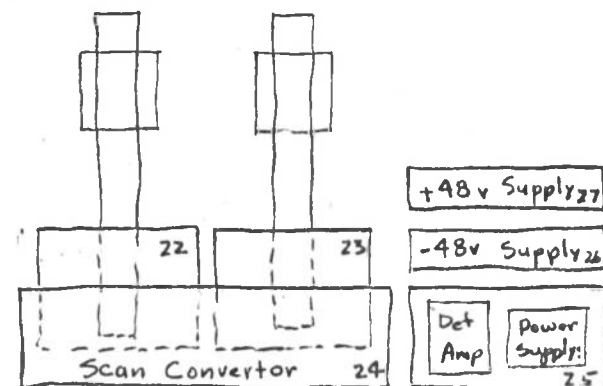




Fans



Fans



Fans

✓ Input Video Processor  $8\frac{3}{4} \times 19 \times 21$

Digital Interface?

increase of  
two

✓ 3 Camera Control  $5\frac{1}{4} \times 19 \times 10$   
camera controls  $5\frac{1}{4} \times 19 \times 10$

✓ X Y Monitor  $8\frac{3}{4} \times 19 \times 21$

1 Test Oscilloscope  $5\frac{1}{4} \times 19 \times 19$

✓ Deflection Amp  $8\frac{3}{4} \times 19 \times 13$

✓ Color Controller  $8\frac{3}{4} \times 19 \times 25$

✓ Switcher  $8\frac{3}{4} \times 19 \times 15$

✓ RPU  $8\frac{3}{4} \times 19 \times 21$

✓ Oscillators  $8\frac{3}{4} \times 19 \times 15$

✓ Terminal  $14\frac{3}{4} \times 13\frac{1}{4} \times 18$

✓ Color Monitor  $10\frac{1}{4} \times 19 \times 18$

✓ Color Encoder  $5\frac{1}{4} \times 19 \times 15$

✓ Waveform & Vector monitors  $5\frac{1}{4} \times 19 \times$   
Cartridge Drive for Standard Data cartridge (instead of floppy disks)  
Cassette ~~Drive~~ Same and Restore Drive  $8.57" \times 4.52" \times 12.06"$  + power supply  $6" \times 6" \times 2"$

✓ Eclipse Computer  $10\frac{1}{2} \times 19 \times 25$

Printer  $10\frac{1}{2} \times 19 \times 25$

✓ Eclipse Disk  $10\frac{1}{2} \times 19 \times 30$

B & W Monitor?  $8\frac{3}{4} \times 19\frac{1}{2} \times$

Floppy Disk  $5\frac{1}{4} \times 19 \times 19$

X-Y Monitor  $5\frac{1}{4} \times 9\frac{1}{2} \times 14$

ll

# S IV Equipment list

4/21/80

- |                      |                                                                                                                 |                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------|
| ✓                    | 1. Eclipse Disk , DG # 6098                                                                                     | 10½" x 19" x 30"          |
| ✓                    | 2. Eclipse Computer, DG 5140                                                                                    | 10½" x 19" x 25"          |
| decision ✓           | 3. Printer                                                                                                      | 10½" x 19" x 25"          |
| decision ✓           | 4. Data Casette, Data Electronics # S-3                                                                         | 8.57" x 4.52" x 12.06"    |
| decision ✓           | 5. Data Casette Power Supply<br>30                                                                              | 6" x 6" x 12"             |
| complete design      | 6. Function Generator (Oscillators)<br>Function Generators.<br>Oscillator combining circuit<br>Multiplexer card | 8¾" x 19" x 15"           |
| complete design      | 7. R. P. U.<br>Generating<br>Manipulating<br>Intensity Comp                                                     | 8¾" x 19" x 15"           |
| computer control     | 8. Input Video Processor<br>Overlap system                                                                      | 8¾" x 19" x 21"           |
| needs refurbishing ✓ | 9. Overlap Camera Control                                                                                       | 5¼" x 19" x 10"           |
| ✓                    | 10. Switcher Electronics, Central Dynamics # VS-10                                                              | 8¾" x 19" x 15"           |
| ✓                    | 11. Digital Terminal ,                                                                                          | (13¼)<br>14¾" x 19" x 18" |
| computer control     | 12. Color Controller Electronics                                                                                | 8¾" x 19" x 15"           |
| ✓                    | 13. Color Encoder , Jelenation # 3001                                                                           | 1¾" x 19" x 15"           |
| ✓                    | 14. Waveform Monitor, Jek # 528                                                                                 | 5¼" x 9½" x 14"           |



✓ 15. Vector Scope, Tek #604  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

✓ 16. Scan Converter Camera Control, Cohn #7900  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

Needs to be  
mounted

✓ 17. X-Y Monitor, Tek #604  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

✓ 18. Color Monitor, Tek # 651HR  $10\frac{1}{4}" \times 19" \times 18"$

✓ 19. Input Camera #1 Control, Cohn #7900  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

✓ 20. Input Camera #2 Control, Cohn #7900  $5\frac{1}{4}" \times 9\frac{1}{2}" \times 14"$

✓ 21. Test Oscilloscope, Tek # 922  $5\frac{1}{4}" \times 19" \times 19"$

✓ 22. Artwork Unit #1, Bencher lite box, controls, camera column, Cohn camera head

✓ 23. Artwork Unit #2, Bencher lite box, controls, camera column, Cohn camera head

packaging

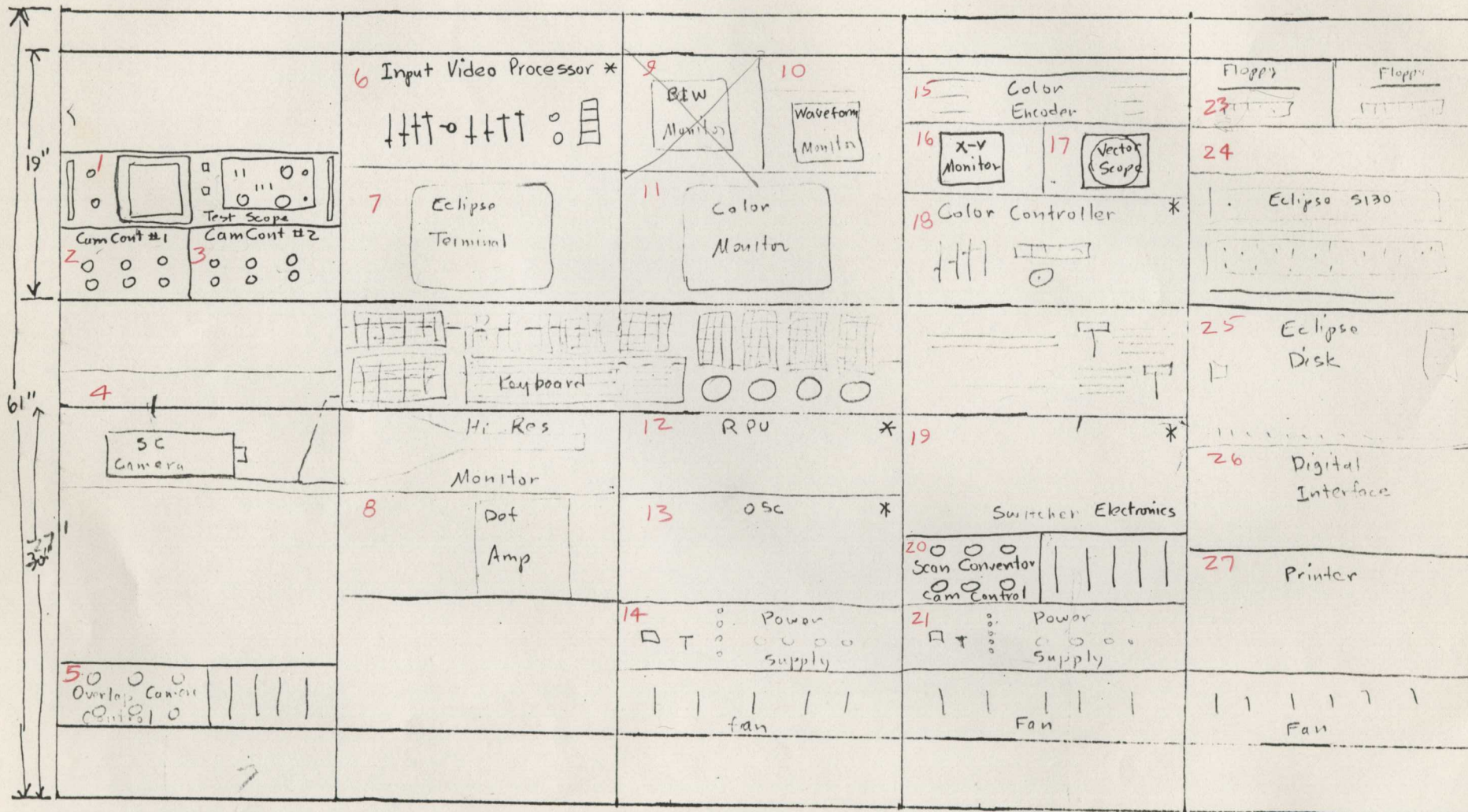
24. Scan Converter  $8\frac{3}{4}" \times 8\frac{3}{4}" \times 40"$

packaging

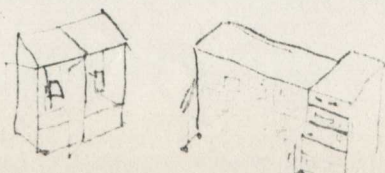
25. Deflection Amplifier  $8\frac{3}{4}" \times 19" \times 13"$

✓ 26. +48 volt Supply, Sola  $5\frac{1}{4}" \times 19" \times 9\frac{3}{4}"$

✓ 27. -48 volt Supply, Sola  $5\frac{1}{4}" \times 19" \times 9\frac{3}{4}"$

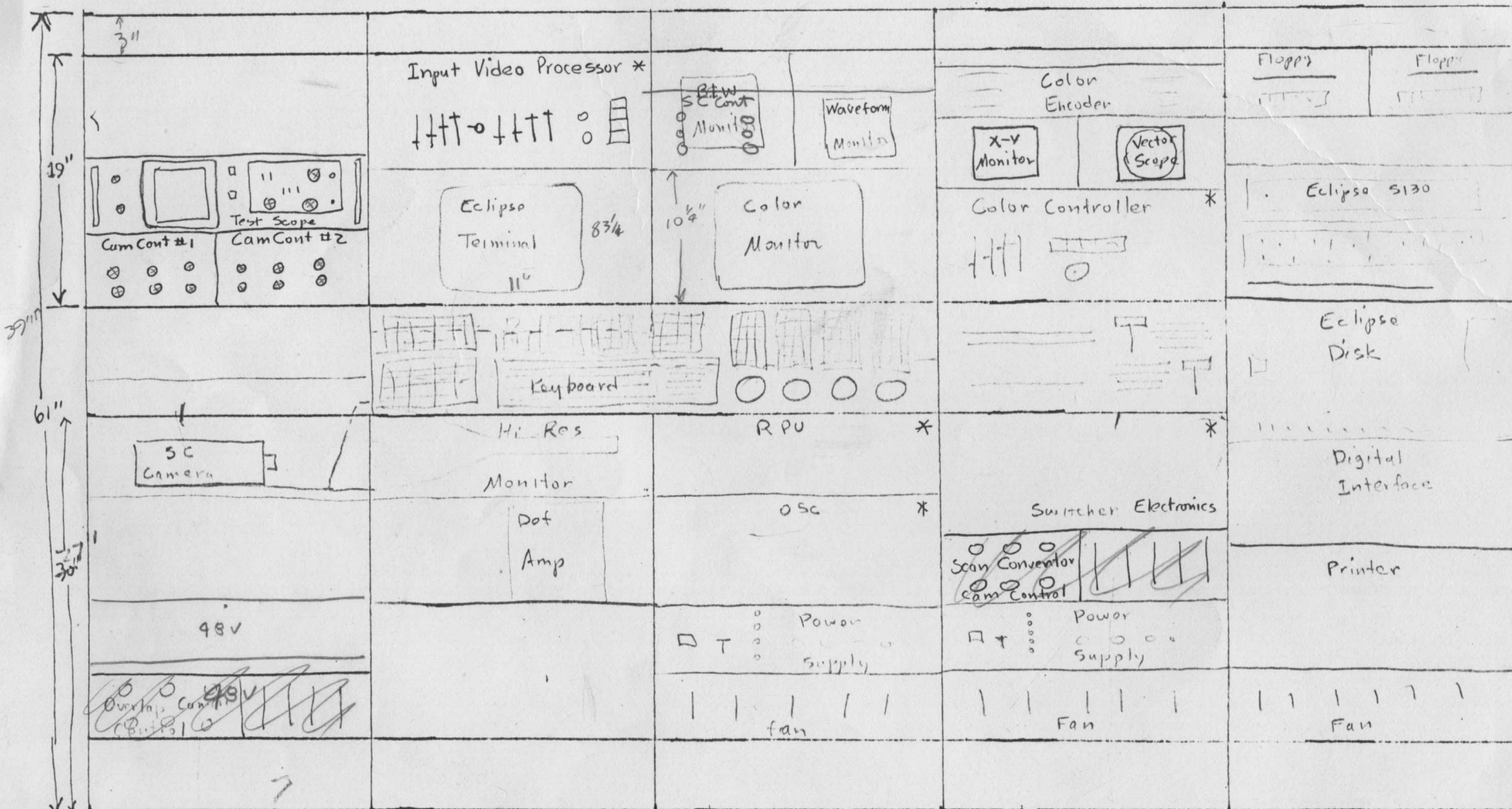


50"  
52"



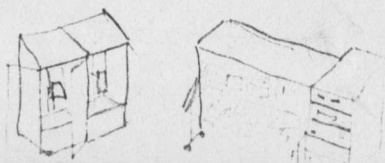
\* need power supplies



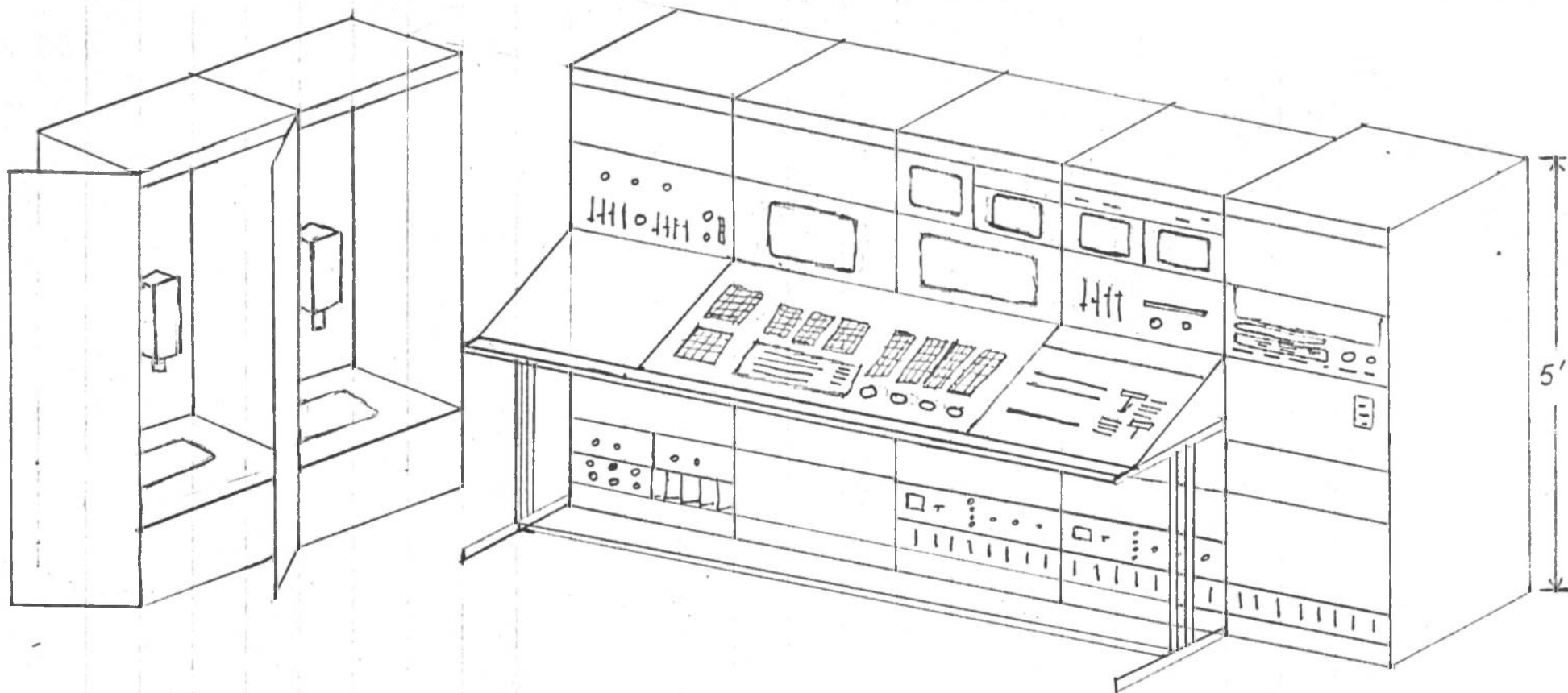


\* need power supplies

60-  
52 1/2







PROTOTYPE SYSTEM IV

jt  
3/3/80

Racks required for prototype SIV

2/19/80

4 racks

61" high  $\times$   $22\frac{5}{32}$ " wide  $\times$  25" deep

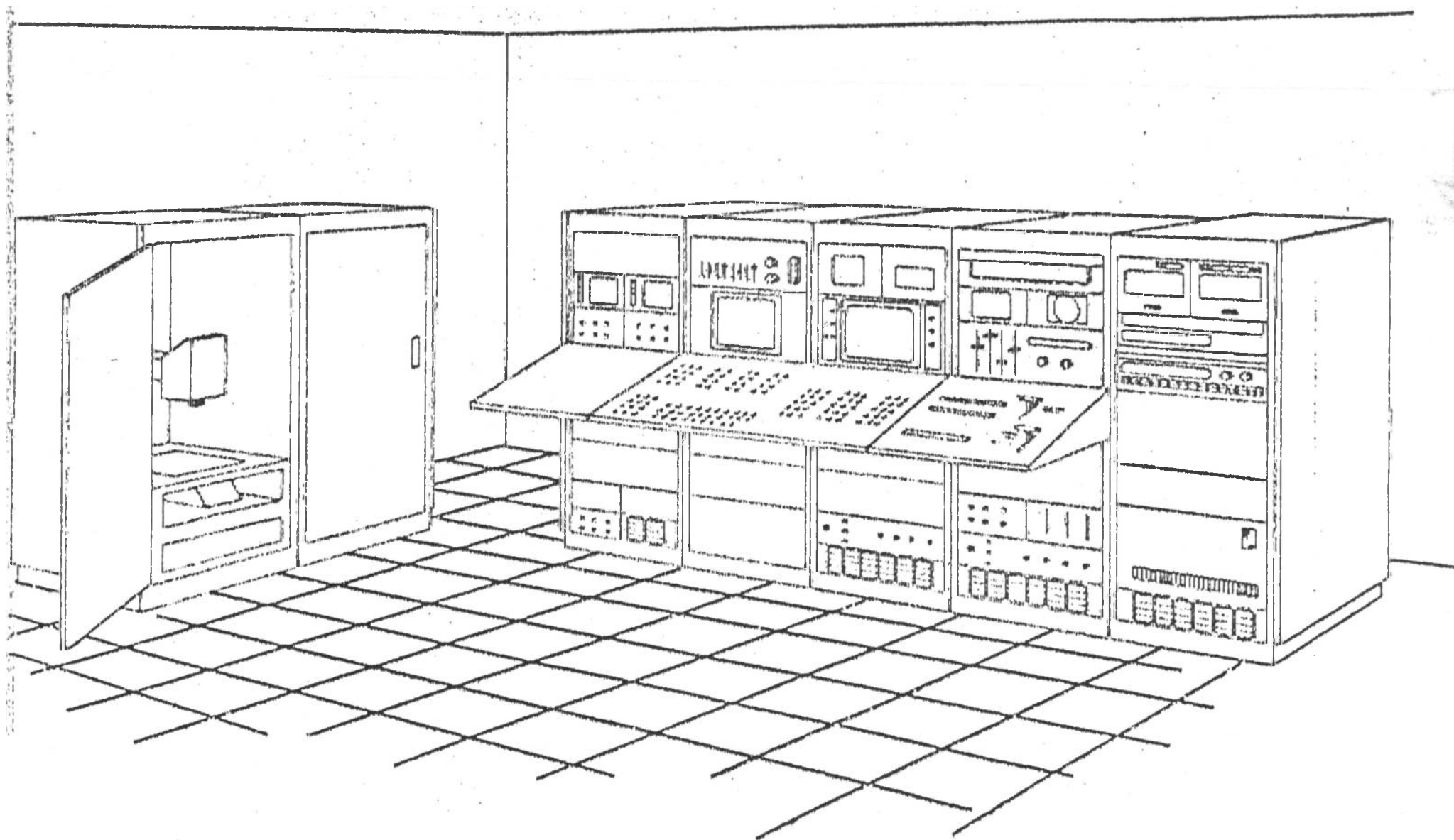
SF 200-52-25

1 rack 61" high  $\times$   $22\frac{5}{32}$ " wide  $\times$   $30\frac{1}{4}$ " deep

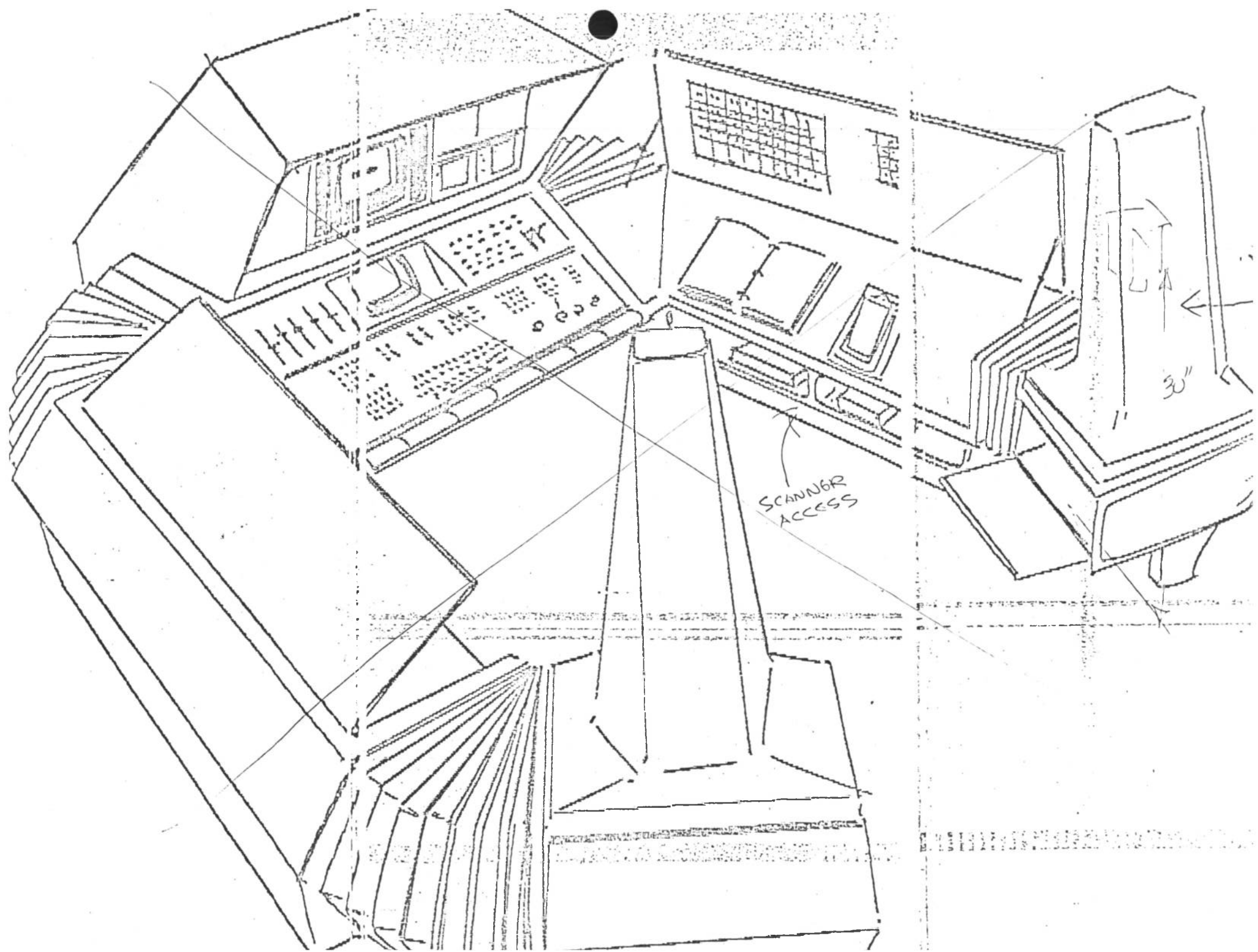
1 Data/Terminal Desk "the Columbia" style with C1105 casters

DA-2-26-72-18

↳ would actually like it to be 88" wide instead of 72" wide so it would cover four racks.











4-10-80

## Bencher light box evaluation

### Advantages

- 1) Very even light source.

Also in this same vein, because there is only one lamp in the Bencher unit, The possibility of uneven light due to a burned out lamp is unlikely.

- 2) High light output.

When the Bencher is in the high light position the camera lens may be stopped down, resulting in much higher resolution and less chance of port holing or vignetting.

- 3) The fact that the light box is NOT enclosed in a rack.

This is advantages for many reasons.

- a) The artist or animator can doctor and work on artwork comfortably without climbing into the rack with the light box.

- b) Easier to attach external devices i.e. rotation devices (it is better to rotate artwork rather than raster because of the scan bar), crawl devices, etc, etc.



c) it would be possible to top light art work (artwork can not be top lit in a rack. The proper method of top lighting requires lights at a  $45^\circ$  angle to the artwork) At this point in time no one has been able to prove there is anything wrong with top lighting and in fact some effects could be better done with top lighting. As far as glare or ambient light on the artwork goes no one yet has complained, plus the Conu camera's have adjustments that could correct for any possible problems that might arise.

d) The fact that the top of the post is not bolted to the top of the rack also has not posed any problems in rigidity

e) by not mounting the light box in a rack there would be a tremendous savings in cost. First of all there would be a savings of



\$729.20 for the cost of the racks and associated accessories. Next there would be a savings in time (which is money) to modify the Bencher units to go into the racks. Estimated time for the modification of two light boxes is 8 hrs. Additional savings would result in the reduction of shipping costs. Total weight of the system would be reduced by approximately 400 pounds resulting in a savings of approximately \$400. Total estimated savings would be around \$1200.

4) Advantages to putting the light box inside a rack.

To be honest, no one was able to come up with any.

### Conclusion -

From a technical, operational, and maybe even esthetic point of view, the Bencher light box will do the job and do it well even without a rack.

Note: No disadvantages were listed because there weren't any.

John Hill



4-10-80

## Evaluation of CONRAC 5700, TEK 650A, TEK 650HR

CONRAC 5700 - Good resolution. Good color rendition.  
Seems to have chroma delay problem.  
Green bars on white shows the problem.

TEK 650A - Good color  
Poor color rejection in the "MONO" mode  
Has the infamous trinitron horizontal line

TEK 650HR - Good color. Good rejection of color  
in "MONO". Very good resolution. Does  
a very nice job on the Green bars  
on white test, sharp edges.  
The trinitron line is there but  
is very suppressed.

Conclusion - Of the three I would say the  
TEK 650HR is the best. The choice  
is based on resolution, and the  
accurate reproduction of the Green/white  
bars test signal.

gh Hill



3/15/82  
94

## EVALUATION OF THE SONY BYM-1201 COLOR MONITOR

The SONY BYM-1201 was evaluated using a TEK. SIGNAL GENERATOR, SYSTEM III ANIMATION, LIVE program material off of a  $\frac{3}{4}$ " cassette, and a green box on a white field pattern from the switcher. The Sony was compared to the present reference monitor, the TEK. G50HR. Both monitors were set up and matched using the IRT color comparator on low and high level flat field, and house bars.

Reproduction of the test signals on both monitors was good. Although, the Sony appears to have a better comb filter circuit allowing the Sony to obtain a better high frequency response of multiburst, than the TEK. The Sony appears to have a notch filter circuit (for 3.58 MHz) ~~whereas~~ whereas the TEK appears to be simply rolling off the high end. When the test generator was allowed to free-run (no GEN-LOCK), the TEK showed the problem a little better than the Sony. Although when both monitors were put in the blue only mode the problem showed up very clearly on the Sony. One point to notice is that in the blue only mode the TEK monitor is in black and white, whereas the Sony display is blue. The blue display is a little harder to

read.

On SYSTEM III video both monitors seemed to accurately reproduce the animation.

When viewing the video tape the TEK had a problem with stability when in normal AFC but was OK when in the fast AFC mode. The Sony was very stable in both normal and fast AFC. The color rendition of the flesh tones on the video tape was good on both monitors.

When the test pattern from the switcher (green box in white field) was ~~feed~~ fed into the monitors, both monitors reproduced it faithfully with no chroma lag.

Miscellaneous observations of the monitors. The TEK had two problems which both could be calibration problems. When the input video signal was changed (no external ~~sync~~ sync) the monitor often lost lock. Secondly the TEK seemed to "overload" much easier than the Sony. The Sony has some nice additional features the TEK doesn't have. The Sony has a built in cross hatch generator, RGB input, front panel control of presets, ~~and~~ and a pull out drawer with convergence, bias, gain, and other miscellaneous adjustments.

In conclusion the Sony meets and exceeds the TEK 650HR specifications, which are our present standards. The recommendation at this point is to use the Sony on ALL future systems.



slide-in sub chassis on which are installed three standard plug-in etched-circuit boards, seven front-panel operating controls, eight rear-panel cable connectors, a power transformer, a bolted-down etched-circuit terminal board, two indicator lamps and a meter to aid in adjustment of video signal level and target voltage). Test points and additional adjustments for subfunctions are located on the front of the plug-in subassemblies and are accessible through the hinged door panel on the front of the enclosure. One additional position is provided in the camera control sub chassis for either an optional sync generator plug-in circuit board or a blanking generator plug-in circuit board.

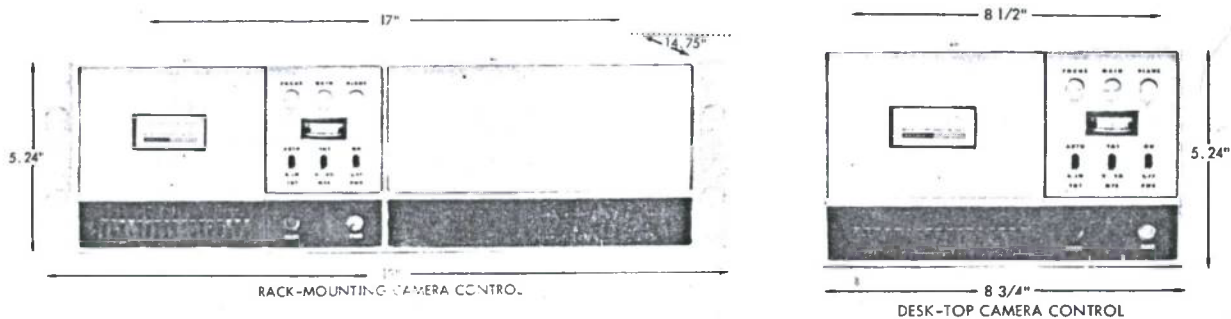


Figure 1-1. 6950 Series Camera Controls

### 1-3. CAMERA CONTROL FUNCTIONS

The block diagram of a typical TV system where the 6950 Series Camera Control would be used with a 6000 Series TV camera is shown in Figure 1-2. In this system the camera control:

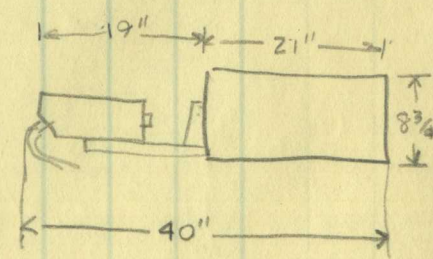
- a. Generates horizontal drive and vertical deflection waveforms, respectively, for a horizontal deflection circuit and a vertical deflection coil winding at the camera;
- b. Produces regulated dc supply voltages for circuits in both the camera and camera control;
- c. Provides operator and automatic controls for video gain and camera sensitivity;
- d. Provides operator controls for focusing of scanning beam on target, adjusting density of scanning beam current and establishing black level of video signal;
- e. Amplifies video signal supplied by camera, compensates for signal transmission losses, and corrects for aperture distortion, gamma distortion and shading aberrations;
- f. Adds synchronizing pulses to video signal;
- g. Supplies the modified video signal on two isolated 75-ohm output lines in composite or non-composite form at voltage levels consistent with the requirements of virtually all TV monitors, video switchers, video tape recorders and video transmitters.



SC  
Camera

deflection  
Amp

Monitor





# Control panel layout design guide

*Published  
by*  
**MICRO SWITCH**  
*a division of  
Honeywell*



# Control Panel Layout Design Guide

by N. Thomas Wolfe and James A. Odom, Honeywell Corporate Industrial Design

## introduction

The following guidelines are provided as a practical aid to the designer who wishes to enhance:

1. The overall function of his control panel.
2. The harmonious appearance of his layout.

The recommendations are general in scope, but outline the essential human factors considerations consistent with good panel design. These considerations are:

### COMPONENT SELECTION

Operator Requirements  
Environmental  
Conditions  
Manual Controls  
Visual Displays  
Maintainability

### ARRANGEMENT

#### USE OF COLOR

Panel and Control Housing  
Color Coding  
Illuminated Color Techniques

#### GRAPHICS

## preparation

Follow basic procedures which are common to the design process. For example, begin by fact-finding to acquire sufficient information about the job to be performed. After deciding what you want to do with the panel, determine how the considerations in this guide relate to your application. Explore alternate means of achieving the desired results and select the most effective combination of components.

## basic panel concept

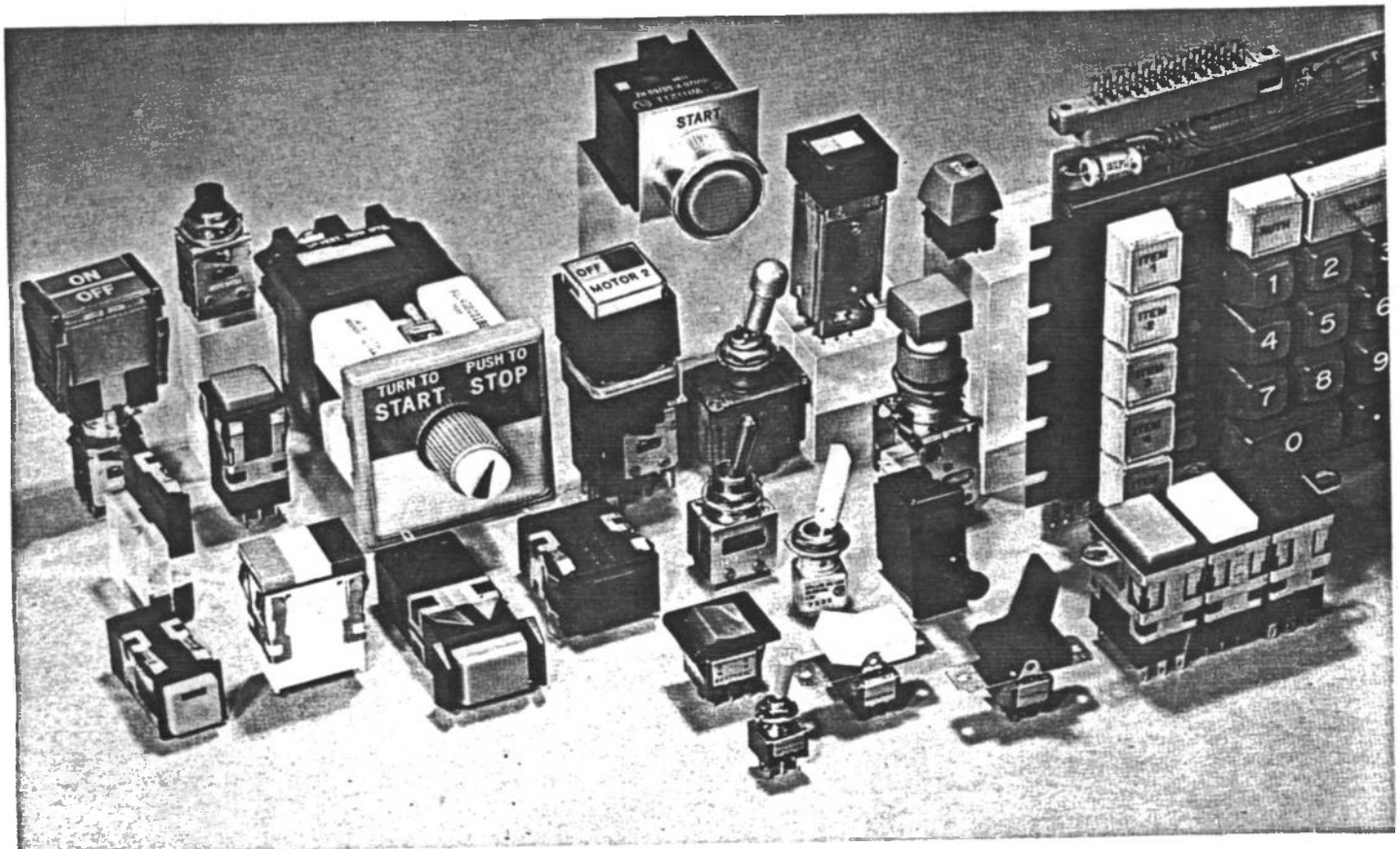
By definition, a control panel is the surface provided for mounting operating controls and is the direct interface between man and machine.

A proper balance of applied human factors and aesthetic judgement is necessary to achieve an effective panel design. The panel should be integrated into the design scheme of the device it serves and should reflect the overall integrity and quality of the product itself. Controls added to a device after it has been defined as a three dimensional form may look like an after-thought and can detract from an otherwise successful design.

## component selection

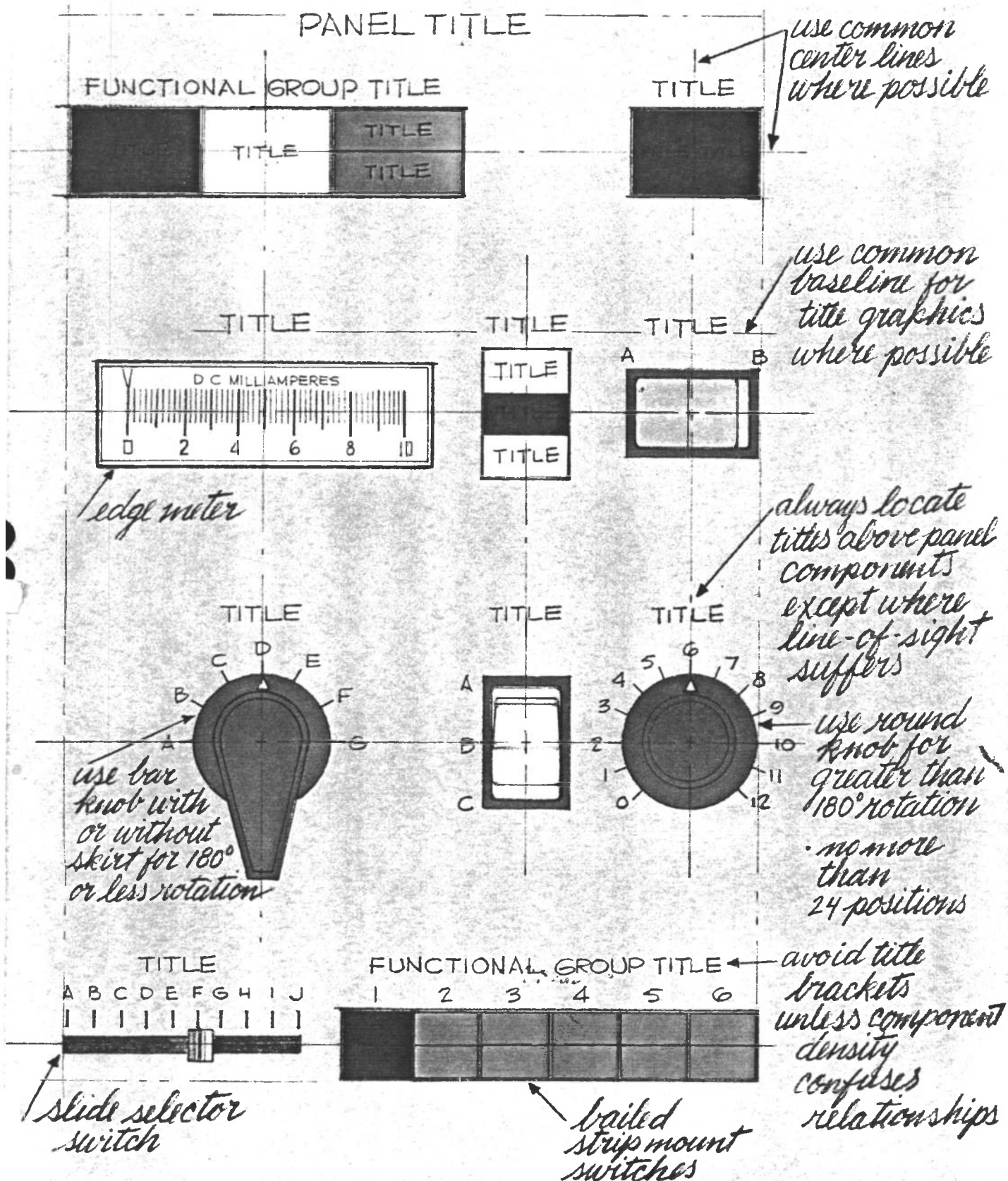
Ideally, there should be mounted on the panel only those controls and visual displays pertaining to the actual operation of the device. Oversized, infrequently used maintenance controls, exposed hardware (screws, latches, handles) or panel access knobs that resemble rotary controls—add confusion to a straight-forward component group.

Where possible, switches, lighted displays, etc., should be sub-panel mounted with only the button or lens visible. This will emphasize the functional elements with none of the distracting hardware that could disorient an operator in a stress situation. (Typical display/switch devices, below.)





# Typical Panel Layout Considerations



## operator requirements

The amount of effort required by the person activating the controls should be consistent with the speed and duration of operation. Selection of components should also complement normal habit pattern reflexes. For example, rapid repeat operations for long periods would dictate a keyboard. This enables continuous high speed input, while lessening operator fatigue. Operating force and control spacing may be more flexible considerations for random or infrequent control functions.

The operator's level of training should be considered. If the operator is relatively inexperienced, it may be necessary to provide more information on the panel and/or limit the number of controls necessary. This is especially true in the case of a business machine, such as an office copier, which is used by many people.

## environmental conditions

In hostile industrial environments where the panel is exposed to cutting oils, water splash, dust, and other contaminants, consider components with sealed operators. This does not necessarily mean appearance need be compromised. For example, there is a wide choice of oiltight manual controls which are built to stand up to rough treatment, yet exhibit a contemporary look to match the panel's timers, recorders, and meters.

Ambient light conditions can enhance or degrade display visibility. The contrast of a lighted display increases as the ambient light level is diminished. This is especially appreciated with low output lamps and projected color or dead front effects. Conversely, a brighter display is needed for recognition in high ambient light. Glare becomes a factor when ambient light comes from undiffused or concentrated sources, as in a sunlit room. (This consideration increases in importance when applied to a fixed installation such as a master building control panel.)

Low ambient temperatures dictate the choice of larger buttons, knobs, or levers when the application involves unheated buildings, such as remotely located warehouses or power stations. In these instances, the controls may be operated by persons wearing heavy gloves or mittens.

## manual controls

As panel components are selected, careful thought must be given to the visual compatibility between switches, indicators, meters, etc. The relationship between one device and another should be readily apparent to an operator, with a minimum of interpretation.

The character of the control panel will be established in part by the type of elements used on it. A utilitarian bat toggle switch, mounted with a hexagonal retainer nut will accommodate most switching requirements, but a sub-panel mounted (no visible mounting hardware) rocker switch will do the same job and impart a statement of quality to the control panel.

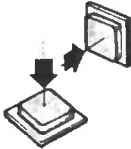
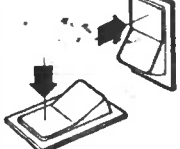
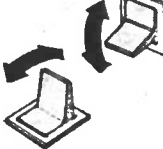
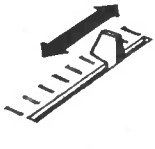
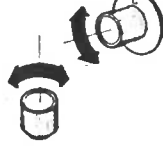
When deciding how inputs are to be made into a device, determine how important it may be to have direct, discrete selection. Horizontally ganged, interlocked or alternate-action, pushbutton switches are considered most efficient for such requirements but must be balanced against the amount of panel space consumed. Contrast the number of pushbutton functions against an equal number of positions possible with a rotary selector and the differences in component density on the panel.

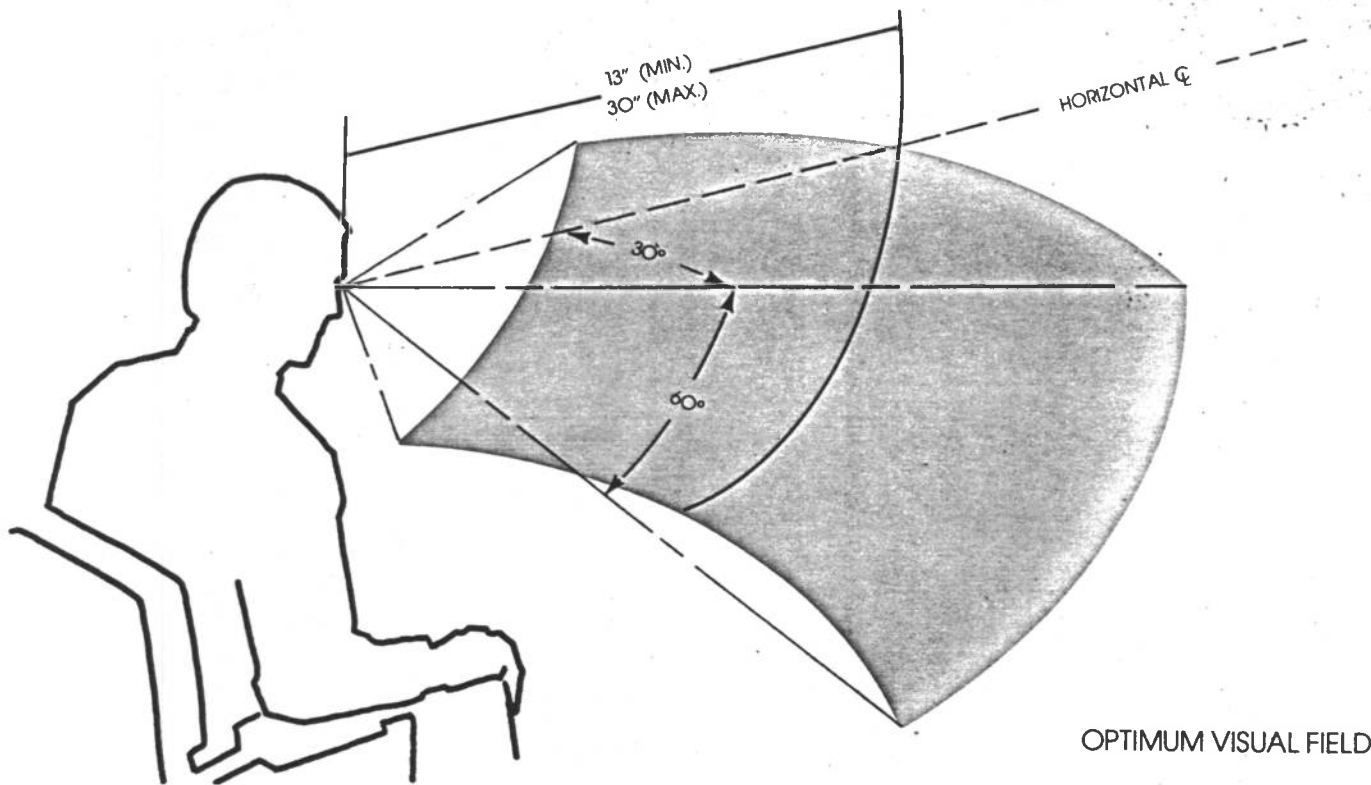
Strive for simplicity. There is a point of diminishing returns when, by sheer weight of numbers, panel elements begin to confuse the visual definition of functional groups. Obviously, some restraint must be exercised in the use of any given component to avoid building in a hesitation factor for an operator. Review as many alternatives as possible before freezing the design.

Guards or barriers should be considered only for controls whose inadvertent actuation could produce an unwarranted effect.

Operation of controls should produce an effect compatible with the direction moved; for example, a clockwise knob rotation results in an increase on a meter scale; left-to-right movement of a slide selector switch results in increased readings.

## control movements

|                  | PUSHBUTTONS                                                                         | PUSH/PULL                                                                           | TOGGLES                                                                             | ROCKERS                                                                             | PADDLES                                                                              | SLIDES                                                                                | ROTARIES                                                                              |
|------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                  |  |  |  |  |  |  |  |
| TYPICAL RESPONSE | ON/OFF, GO, INCREASE, START/STOP, TEST, ALARM, JOG                                  | ON/OFF, IN/OUT, START/STOP, UP/DOWN                                                 | ON/OFF, UP/DOWN, LEFT/RIGHT, INCREASE/DECREASE                                      | ON/OFF, UP/DOWN, LEFT/RIGHT, INCREASE/DECREASE                                      | ON/OFF, UP/DOWN, LEFT/RIGHT, INCREASE/DECREASE                                       | DISCRETE SELECT, LEFT/RIGHT, UP/DOWN, INCREASE/DECREASE                               | DISCRETE SELECT, INFINITE ADJUST, INCREASE/DECREASE                                   |



OPTIMUM VISUAL FIELD

*VIEWING EASE and physical reach convenience are enhanced by adhering to recommended design limits for reach and viewing angles to control elements. A preferred control reference frame*

*is shown above. For full-wall industrial monitoring arrays, displays would have to be proportionally increased in size to allow for comfortable viewing at a greater distance.*

## Visual displays

Visual displays provide an operator with status reminders and/or indicators of conditions that require special attention. They should be spaced according to their relative importance to the operation of the device and their relationship to the manual controls.

**Recognition Factors.** Selection of a visual indicator component depends on the type, amount, and accuracy of the information required. The display should not contain more information than is necessary. The information displayed should be capable of quick and accurate reading within the needs of the operator, i.e., quantitative, qualitative, or check-out.

Present information in the most meaningful form. Good display design is free of features which might be ambiguous or cause operator error. It should require the minimum of time for the operator to translate to other units.

**Indicator Options.** A lighted pushbutton is ideal for indicating a few discrete condition changes (qualitative). Two, three and four-way split buttons can be used to convey a sequence of status changes. For applications requiring large-size legends, coordinated panel control devices are available. They provide a 2-1/4" square segmented display for indication only or may have a pushbutton, selector, or selector-push actuator located in the center of the unit. Such multi-function control/indication devices also promote savings in panel space.

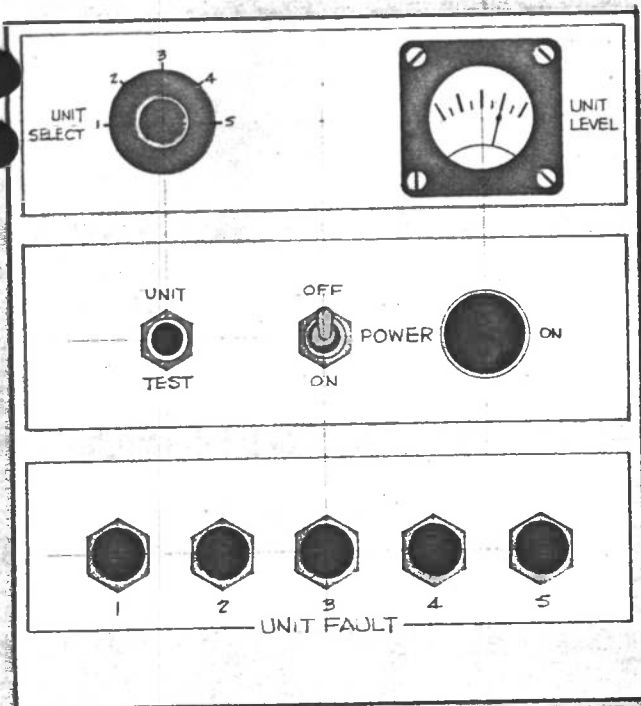
Lighted digital meters are ideal for indicating numeric values for quantitative readings or equipment check-out. They have many advantages over traditional analog "pointer-and-scale" meters. For example, digital meters

have a greater viewing distance for a given panel area, have no parallax, and can be read from across a room with less chance for error. However, analog meters have the advantage if the full value range must be referenced.

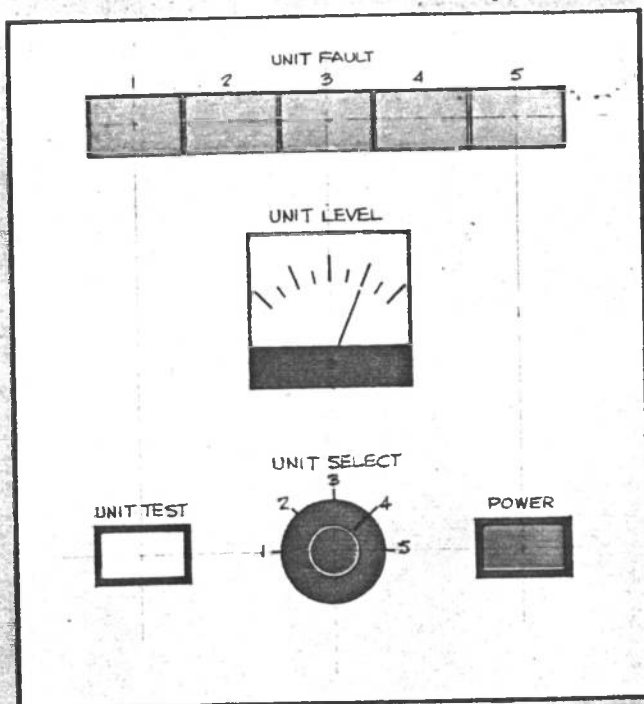
## maintainability

Maintainability of panel components and the accessibility of replacements in the marketplace should be considered. Determine not only how easily they can be installed, but how easily they can be relamped, replaced or otherwise repaired. In highly critical monitoring circumstances, lamp redundancy may be essential for safety reasons.





POOR



PREFERRED

BEFORE-AND-AFTER views, above, illustrate how an existing design may be upgraded through component substitution and layout revision. Both function and appearance are improved. For example, the lefthand panel's outline frames serve only as a decorative feature and create a crowded feeling. They are eliminated completely in the righthand panel, as the components themselves define the functional groups by space alone. The use of square and rectangular panel elements further simplify and unify the appearance. The unit fault indicators are given

more prominence at the top of the panel. An operator's hand will not cover the displays when the rotary control or unit test button is being used. The power switch has been combined with an integral indicator, thereby eliminating the separate "on" light. Finally, all the graphics in the preferred scheme are consistent in their relationship with the panel elements. The legends appear above their respective components, rather than in the random arrangement employed in the lefthand version.

## arrangement of components

Some control panels become quite complex because of the number and types of components. Therefore, it is recommended that paper or cardboard cutouts be made of the separate switches, indicators, etc., prior to drawing any of the elements on the panel outline. These cutouts can easily be moved about until the most effective arrangement is found, thus saving many hours of work and perhaps preventing a poorly conceived layout. Prime considerations are:

1. Frequently used controls should be most accessible (somewhere between elbow and shoulder height).
2. Controls should be arranged in sequence of operation from left-to-right and top-to-bottom.
3. Define functional groups on the panel by spacing components in an orderly arrangement. Avoid outline frames, color patches and brackets extending from group titles except in cases of extreme component density.
4. Emergency controls and displays should be prominently located on panel faces to insure easy viewing and rapid access by an operator.
5. Where large panel layouts are necessary, the workload should be distributed between both of the operator's hands, for ease of operation and added safety.

6. Displays requiring frequent reference should be mounted nearest the normal sight line.
7. Displays should be arranged for sequential viewing by an operator, reading from left-to-right and top-to-bottom.
8. Displays should be located above or to the left of manual controls to prevent visual interference when the manual controls are in use. When manual controls are at the extreme left of a panel, displays should be located only above the controls.

## use of color

Color is a psychological experience, and therefore, color preference is almost completely subjective. For this reason, the selection of color for the control panel and the panel components is best performed by an individual well versed in color/response relationships (e.g., an industrial designer).

## panel and control housing

When a family of products is being designed, a planned color theme is usually carried through with the production of successive devices. A single product or the first of a line should, if possible, have color areas defined in terms of the application. For example, scientific and technical apparatus should exemplify a dignified, orderly character through restrained color use. Consumer products may use color in keeping with the market atmosphere. Brighter, informal colors and combinations of color would be appropriate on many household devices.

Matte or non-reflecting panel finishes aid contrast and visibility. Matte dark gray, black, or beige yield good contrast to a display of any color.

The order in which color is selected for the control panel and panel components is determined by whether or not an established product format is being continued or a new product is being developed. In the case of the established line, the previous color scheme will usually prevail. A new product offering allows more freedom in choosing the components and their color.

The color of bezels and component housings can work to enhance the overall function of the control panel when properly used to blend or contrast with their background. For instance, white bezels can connote compatibility with a clinical installation where antiseptics is a concern. If a black bezel is used against a black panel, the main focus becomes the button and/or indicator color. A neutral gray bezel may be used against a variety of colored backgrounds.

## color coding

Color coding of indicators and lighted pushbuttons should be consistent with accepted human factors standards. General color associations include:

1. **Red** should be used to alert an operator that an incompatible condition exists and that corrective action should be taken. Examples of indicators which should be coded red are those displaying such information as "NO-GO", "ERROR", "FAILURE", "STOP", "EMERGENCY STOP", "MALFUNCTION", etc.
2. **Yellow** should be used to advise an operator that a marginal condition exists. Yellow can also alert the operator to situations where caution, recheck or unexpected delay is necessary.
3. **Green** should be used to indicate that the monitored equipment is in tolerance or a condition is satisfactory and that it is all right to proceed—"GO-AHEAD", "ON", "IN-TOLERANCE", "READY", etc.
4. **White** should be used to indicate system conditions that do not have "right" or "wrong" implications, such as alternative functions ("BOILER #1 ON LINE") or transitory conditions ("RESERVOIR CYCLING"), providing such indication does not imply success or failure operations.
5. **Blue** may be used for an advisory light, but preferential use of blue should be avoided. Because of its position at the lower end of the visible spectrum and generally lower intensity in a common ambience with the other colors cited, blue acts less as a stimulus, thereby limiting its value as a coding element.

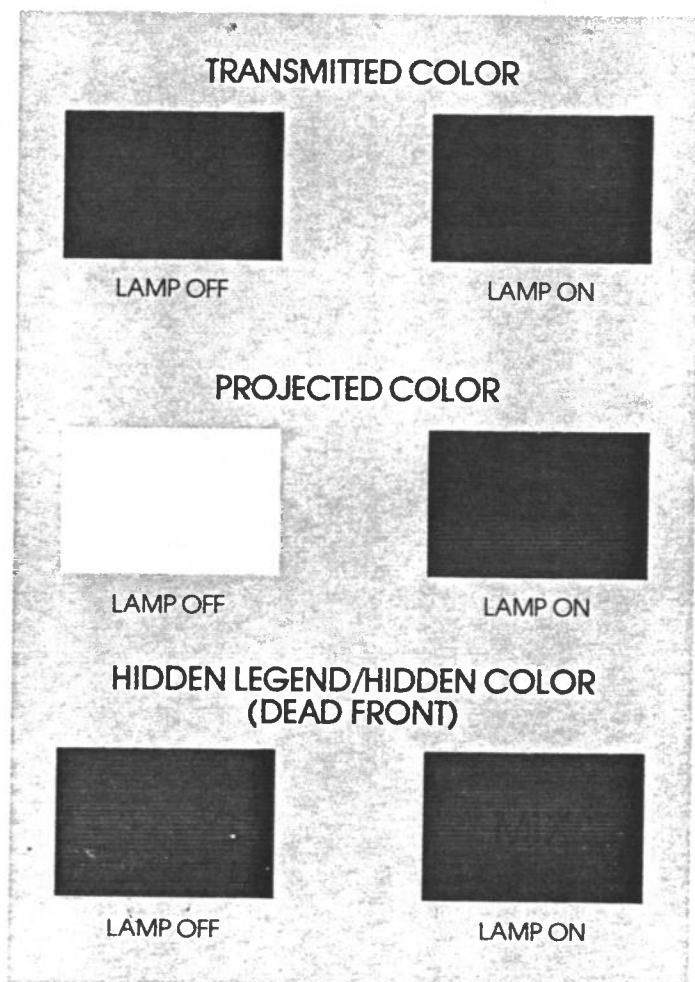
It is important to note that the color of ambient light and adjacent colors influence the apparent color of a subject element. It would therefore be wise to use black, white, or gray surfaces immediately surrounding the color-coded elements on a control panel where maximum impact is required.

## illuminated color techniques

**Transmitted color** refers to the use of colored buttons in applications where the color must be distinguished when the display is unlighted.

**Projected color** is achieved with a white button and color insert (or color filters over the lamps). When the lamps are off, the display is white. It becomes colored when illuminated. Projected color displays are effective in dimly lit or dark rooms. But they have the disadvantage of dilution; color tends to wash out under high ambient light. This is because the display signal is just one color, while the white button reflects a large amount of incident ambient light which tends to wash out the signal.

**Hidden legend/hidden color** displays generally use a transparent smoky gray button with a legended color insert. The display appears black (dead front) when the lamps are off. When illuminated, color and legend appear. A dead front panel enables "control by exception". It can contain a great deal of potential information bits. But few legends are displayed at the same time. This technique should be used when it is desirable to eliminate or subdue color inputs to the operator until a specific condition occurs which requires his attention.



## graphics

In addition to legends which may appear on pushbuttons, labels, and lens caps, it is often necessary to provide titles on the panel face to designate functional groups or to describe specific functions of devices.

Titles should normally appear over the control to prevent visual interference while the control is in use. An exception would be when panel components are required at a height that would block the operator's line of sight to the title.

2. When different-sized components are used in a horizontal array on a panel, it is good practice to pick a common base line for all their associated titles to avoid a stepped, disorderly look.

3. All legending on control panels should be composed of a simple, sans serif typeface for optimum clarity. A standard, normally proportioned typeface should be used except where limited panel space may require condensed lettering to avoid crowding.

4. The height of the lettering should correspond to the functional priorities of the control panel components. Individual applications may vary requirements, but grossly oversized letters should be avoided. Typically, letter heights might decrease as follows:

|                                            |       |
|--------------------------------------------|-------|
| Panel Title . . . . .                      | .187" |
| Group Title. . . . .                       | .125" |
| Control Title or Position Marking. . . . . | .093" |

5. Remember that graphics need not overwhelm the operator with their size, since they are normally viewed at no more than arm's length. Legibility is reinforced when the color of the graphics contrasts with the background.

## evaluation

Before finalizing your design, evaluate the total panel layout experimentally to determine if it effectively communicates. Set up a test situation, using a typical operator. Should the operator experience difficulties, identify the problem source and take appropriate corrective action before turning the design over to production.

## references

More specific information and examples may be found in the following publications:

"HUMAN ENGINEERING GUIDE for EQUIPMENT DESIGNERS", by W. E. Woodson and D. W. Conover, University of California Press, 1966.

"HUMAN ENGINEERING GUIDE to EQUIPMENT DESIGN", by C. T. Morgan, J. S. Cook, A. Chapanis and M. W. Lund, McGraw-Hill Book Co., Inc., 1963.

"HUMAN FACTORS PRINCIPLES FOR KEYBOARD DESIGN AND OPERATION", Honeywell, Inc., Systems and Research Center, 1970. Available without charge from MICRO SWITCH, upon request.

"MAN-MACHINE ENGINEERING" by A. Chapanis, Wadsworth Publishing Co., Inc., 1965.

"MILITARY STANDARD 1472A-HUMAN ENGINEERING DESIGN CRITERIA for MILITARY SYSTEMS, EQUIPMENT and FACILITIES", Department of Defense, 1970.

"THE ADVANCED MANUAL LINE", MICRO SWITCH, a Division of Honeywell, 1975. Available without charge, upon request.

"THE MEASURE OF MAN", by Henry Dreyfuss, Whitney Library of Design, 18 E. 50th Street, New York, NY, 1967.

## for further information

Due to the subjective nature of control panel layout design and other human factors engineering topics, the preceding material is presented as a general set of guidelines. Manufacturers of panel components are an ideal source for application information, as it relates to your specific requirements. MICRO SWITCH personnel, backed up by many years of human factors engineering experience, are available to help you solve your panel design problems on a personal basis.

Whether you're prototyping a new panel or planning to modify an existing design, when it's time to specify control components, it's likely you'll benefit by considering the broad line of MICRO SWITCH pushbuttons, indicators, toggles, paddles, rockers, rotary selectors and keyboards. They represent the largest selection of manual controls in the world. For complete information on these products, call a MICRO SWITCH Branch Office or write to: Dept. 74Q, MICRO SWITCH, a Division of Honeywell, Freeport, IL 61032.

# MICRO SWITCH

FREEPORT, ILLINOIS-61032

A DIVISION OF HONEYWELL

IN CANADA: 740 Ellesmere Road, Scarborough, Ontario. INTERNATIONAL: Sales and service offices in all principal cities of the world.



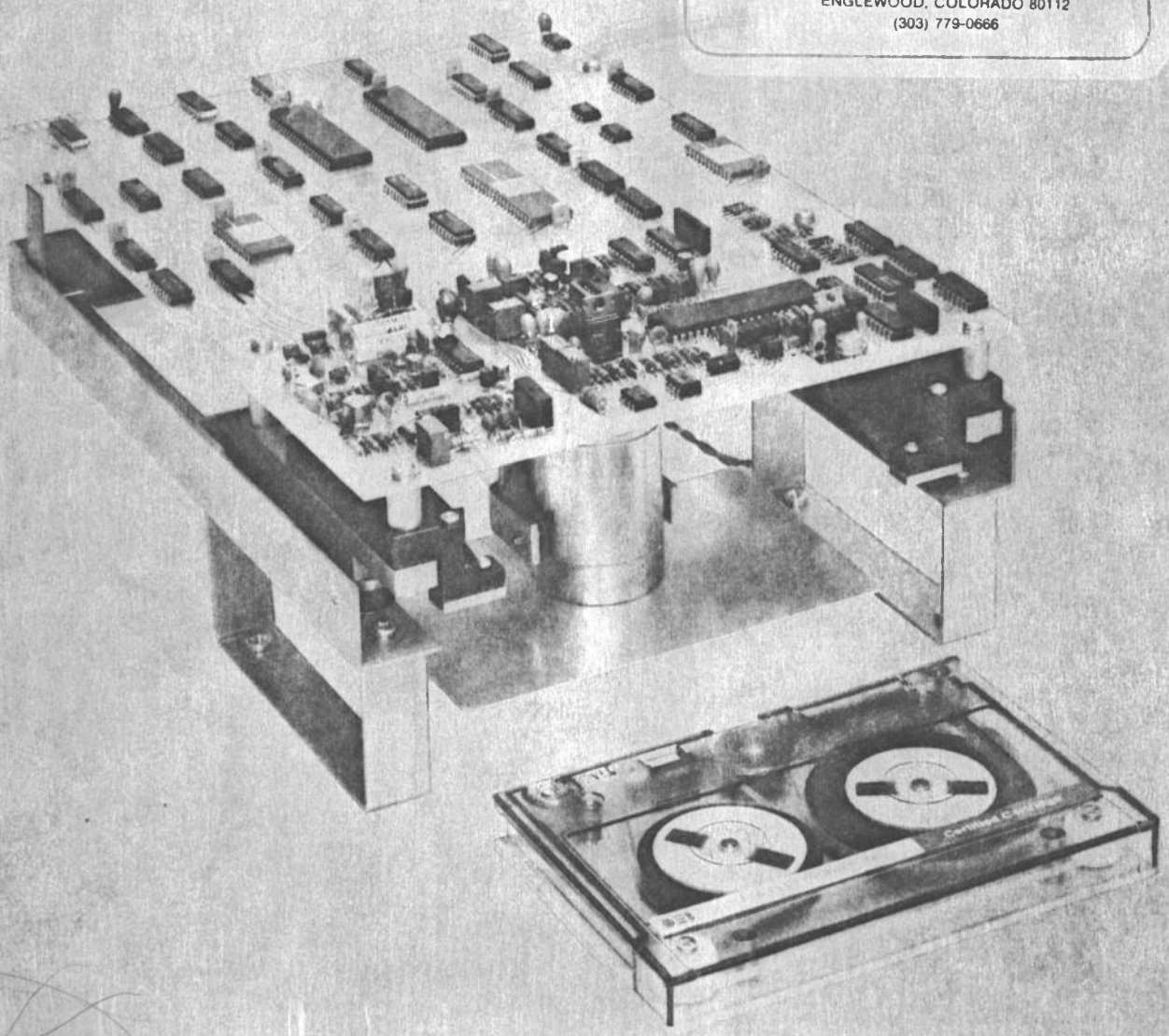
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# THE STREAMER

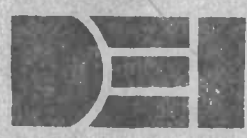
## S-3 SERIES 10 and 20 MBYTE CARTRIDGE MAGNETIC TAPE DRIVES



THORSON ROCKY MOUNTAIN, INC.  
*Engineering Representatives*  
7076 SOUTH ALTON WAY, BUILDING D  
ENGLEWOOD, COLORADO 80112  
(303) 779-0666



DEAN STAKFFER



DATA  
ELECTRONICS  
INC.

WALTER TICE

FIRST IN  
CARTRIDGE TAPE DRIVES

## GENERAL DESCRIPTION

Fixed disk drives require removable media back-up systems that provide a save-and-restore function. "Streaming" 1/4" Cartridge Magnetic Tape Drives from DEI are the ideal back-up choice for systems designers.

The streaming drive allows essentially all of the available tape in the cartridge to be used for data storage by eliminating the traditional starting and stopping between data blocks and the associated interblock gaps. By eliminating the gaps the data is recorded in what appears to be a continuous stream on the tape using a serpentine track arrangement (i.e., bi-directional recording with read-while-write checking).

What's more, because starting and stopping becomes very infrequent, tape speed can be increased from 30 in/sec to 90 in/sec with a resultant increase in transfer rate to 675 kbits/sec. Streaming also eliminates the necessity for rapid start/stop servo electronics and mechanics, which results in a real cost savings, as well as a reduction in power requirements and associated heat dissipation.

DEI's streaming formatter/controller separates incoming data into blockettes, and inserts between each blockette an internal address, resync, and error detection

and correction characters. During the write mode the data is verified within the drive. In the read mode, these extra characters are stripped, and only data is returned to the host.

When examined, the streaming controller interface looks like a semiconductor memory element. The Streamer may be thought of as a nonvolatile first-in-first-out (FIFO) memory, and can be integrated about as easily into a system. Complex timing and data handling requirements are eliminated.

Systems integration is also enhanced by the Streamer's industry standard dimensions that allow it to mount in the same space as a flexible disk drive using standard mounting hole locations.

Both 10 and 20 megabyte formatted capacity models are currently available. All models in this family of Streamers have identical interfaces and dimensions providing for maximum systems flexibility and upward compatibility as future increases in capacity are made available.

Streaming Cartridge Magnetic Tape Drives from DEI offer a low cost, high performance, flexible, easily adaptable solution to your fixed disk back-up requirements.

## SPECIFICATIONS

|                    |                                                         |                       |                                                           |
|--------------------|---------------------------------------------------------|-----------------------|-----------------------------------------------------------|
| Model:             | CSR 7510-90-S3 (10 Mbyte);<br>CSR 7520-90-S3 (20 Mbyte) | Voltage Requirements: | +24 Vdc (1.5 amps), +5 Vdc (1.5 amps)                     |
| Cartridge:         | ANSI X3.55-1977, (450')                                 | Recording Density:    | 7500 bpi (2950 bpcm)                                      |
| Recording Mode:    | 2 or 4 Track Serpentine                                 | Capacity (Formatted): | 10 or 20 Mbytes                                           |
| Head Type:         | Dual Gap, Read-While-Write with<br>Separate Erase       | Operating Speed:      | 90 ips (228.6 cm/s)                                       |
| Tape Cleaner:      | Integral                                                | Transfer Rate:        | 675 kbits/sec (84.4 kbytes/sec)                           |
| Temperature:       | +5°C to +45°C Operating<br>-30°C to +60°C Storage       | Data Reliability:     | Less than one error<br>in 10 <sup>10</sup> bits           |
| Relative Humidity: | 20% to 80% Non-Condensing                               | Weight:               | 5.0 lb (2.3 kg)                                           |
| MTBF:              | ≥3500 hours                                             | Dimensions:           | 8.57" x 4.52" x 12.06"<br>(21.76 cm x 11.5 cm x 30.63 cm) |
| MTTR:              | ≤30 minutes                                             |                       |                                                           |

For more detailed information on the Streamer, request Product Specification 307130

### FIELD OFFICES

**Data Electronics, Inc.**  
125 East Dunstable Road  
Nashua, NH 03062  
(603) 888-6262  
W.C. Holland  
Regional Manager

**Data Electronics, Inc.**  
510 Lawrence Expressway, Suite 210  
Sunnyvale, CA 94086  
(408) 739-7882  
M.J. O'Rourke  
District Manager

**Data Electronics, Inc.**  
19752 Mac Arthur Blvd., Suite 225  
Irvine, CA 92715  
(714) 752-0659  
W.G. Lynn  
Regional Manager

### Local Sales Representative:

*Standard Power*

SPS 15-5 4x 4.75 x 2.06  
\$26.00

SPS 40-24/28 5.65x 4.94 x 3.25  
\$54.00

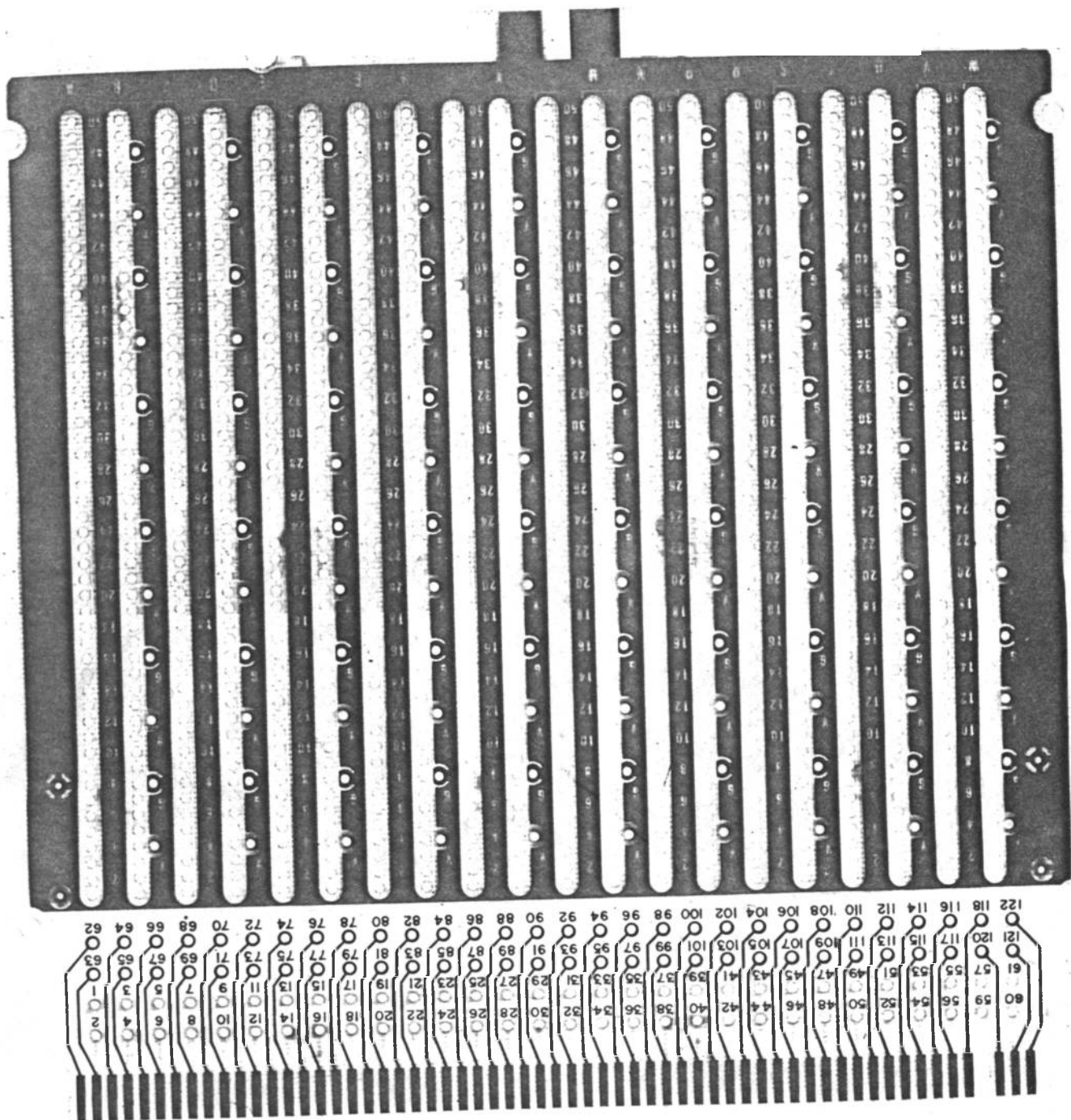


For hostile environments, request information  
on DEI R Series Ruggedized Drives

DATA ELECTRONICS, INC. • 10150 SORRENTO VALLEY RD • SAN DIEGO, CA 92121 • (714) 452-7840 • TELEX 69-7118

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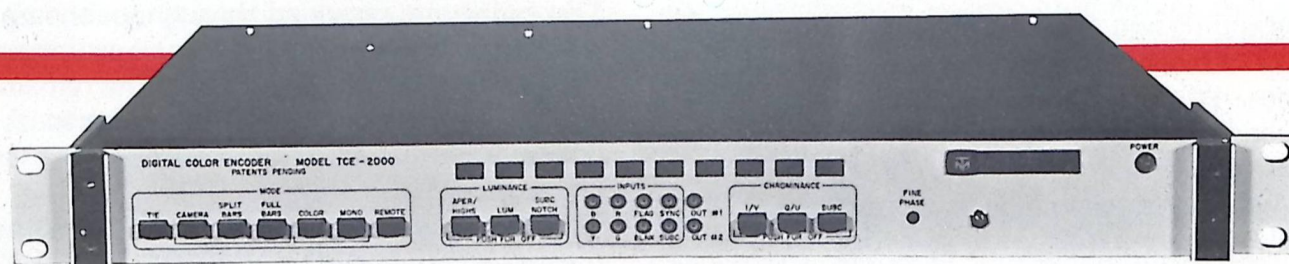




# Digital Color Encoders

## Series TCE-2000

### For NTSC/PAL/PAL-M Systems



## Features

- Available for NTSC, PAL-I, PAL B, G, & H or PAL-M Operation
- Drift-free Digital Modulators (U. S. Patent No. 3721755)
- All-Digital Color Bar Generator – Full/ Split Bars – Optional
- Level-Dependent Proportional Aperture Correction
- 100% Circuit Access During Operation – No Extenders Required – No Phase Shift or Gain Change During Adjustment
- Umbilical Connection for Instant Service Replacement
- Remote Chroma Boost – Ideal for Film
- Subcarrier Rejection Typically > 55dB
- No DC Shift with APL Change
- Drift-free Current Summing Matrices (U. S. Patent No. 3715470)
- Meets All Specifications over 100-130 VAC, 0°-60°C Range without Readjustment



**TELEMATION, INC.**

P. O. BOX 15068, SALT LAKE CITY, UTAH 84115, (801) 487-5399

TELEX: 388-352



## General

TeleMation Series TCE-2000 Digital Color Encoders are available to produce NTSC, PAL or PAL-M encoded color signals according to NTSC, CCIR and EBU specifications. With the use of digital circuitry and precision components, TeleMation has minimized set-up and maintenance requirements on the TCE-2000 Series.

The TCE-2000 Encoders are designed for use with both live and film cameras, either three or four-tube types. All inputs are bridging with looping jacks provided. Compensation networks assure excellent input return loss characteristics.

Internal strapping and front panel controls are provided to permit operator selection of various enhancement modes. When using the aperture circuit, the high frequency component of the luminance channel may be derived either from the G or Y signal when operating with three-tube cameras or from the G, Y or M signal when operating with four-tube cameras.

Aperture boost is adjustable from zero to 10dB at 3 MHz (4 MHz and 5 MHz delay lines available on special order). Aperture correction is level dependent to provide enhancement proportional to luminance level. A threshold adjustment is also provided to eliminate all aperture boost below a selected luminance level. This technique of combining the mixed highs capability with a phaseless aperture circuit results in optimum horizontal enhancement capabilities.

Remote or local selection of monochrome operation is also provided to select either G or Y signals in the case of three-tube operation. Strapping is also provided to permit monochrome operation with burst if desired.

A "Green Tie" mode is provided, in this mode the same signal is connected to all matrix inputs to provide a positive linearity test of the encoder.

The TCE-2000 also provides improved four-tube camera operation through a "Livingston Error Correction Circuit" that permits the operator to select matrixed Y for the low frequency luminance component. This effectively eliminates the error in luminance level otherwise present in four-tube systems.

A subcarrier notch control permits the operator to reduce moire effects by introducing a 6dB notch in the luminance channel at the subcarrier frequency.

Two program outputs are provided with sync addition strappable on each. One of the outputs is also strappable to provide a constant monochrome signal.

Test points are provided throughout the unit. Those associated with the most critical waveforms are located on the front panel while the remainder are accessible with the electronics drawer in its extended position.

The luminance channel incorporates a white clipper that is factory-wired to provide for soft clipping action similar to the "knee" produced by image orthicon tubes. With a simple field change the circuit can be modified to provide hard clipping action.

## Elimination of Drift and Instability Problems

The matrix and modulator sections in conventional analog encoders are the source of most drift and instability problems. The TCE-2000 encoders incorporate unique circuitry developed by TeleMation to combat the various drift sources. Matricing circuits use a highly stable current-adding technique (U. S. Patent No. 3715470) while the "digital" modulators (U. S. Patent No. 3721755) operate in the switching mode to eliminate balance drift. Precise quadrature is maintained by digitally deriving the modulator switching signals from a phase-locked oscillator operating at four times the subcarrier frequency. Junction matching and complementary symmetry tech-

niques, as well as conventional feedback circuitry, are also employed to insure minimum drift with temperatures, line voltage or aging. All critical resistors have either 1% tolerance rating with temperature stability better than 100 PPM per °C or 0.1% tolerance and 10 PPM per °C stability.

The end result of these various stability techniques is an encoder that provides rigid specifications and holds them over a 0°C to 60°C range, and not only over a 10°C range.

## Digital Color Bar Generator

A digital bar generator is optionally available with TCE-2000 Encoders. It produces ultra-stable color bars having amplitude accuracy of  $\pm 0.5\%$  and phase

TCE-2000 Encoders are directly strappable to produce all commonly required color bar formats:

|            |                                                                                      |
|------------|--------------------------------------------------------------------------------------|
| NTSC 7-Bar | Per EIA Standard RS-189, 75% Amplitude, 100% Saturation, 75% White Reference         |
| FCC 8-Bar  | Per FCC Rule 73.699, Figure 14, 75% Amplitude, 100% Saturation, 100% White Reference |
| EBU 8-Bar  | 75% Amplitude, 100% Saturation, 100% White Reference                                 |
| BBC 8-Bar  | 100% Amplitude, 95% Saturation, 100% White Reference                                 |
| 100% 8-Bar | 100% Amplitude, 100% Saturation, 100% White Reference                                |

## 100% Access During Operation

TCE-2000 encoders use a packaging technique previously developed and proven by TeleMation on its top-of-the-line broadcast equipment. This construction method utilizes a drawer containing all of the active circuitry connected to the chassis frame by means of a folding umbilical assembly. The drawer can be extended during operation with no detectable change in any of the output signals. This provides

instant access to internal adjustments while avoiding the phase and amplitude changes that are inherent with systems employing extender cards. Removal of the entire encoder electronics is accomplished by unplugging the umbilical assembly connectors and releasing two safety latches.

## Timing Options

As normally supplied, the encoder operates in the "zero delay" mode where sync blanking and burst flag incur no more than a 25 nsec delay from input to output. For those installations requiring delayed signals from the encoder, a plug-in Pulse Delay Module is optionally available. This module incorporates delay multivibrators capable of matching the luminance/chrominance delay as well as matching camera cable delays in excess of 2  $\mu$ s.

## Remote Control Provisions

Remote selection of Camera Split Bars/Full Bars, and selection of the color or monochrome mode is provided. Also provided, and especially important when utilized with color film cameras is a remote *Chroma Boost* circuit that allows chrominance to be adjusted from normal through +6dB. A warning light on the Remote Control Panel indicates the chroma boost control is engaged. Tally lights are also provided on the encoder with remote provision to indicate the remote control condition. Strapping is provided to permit control delegation at either the local or remote positions.

The remote provisions of the TCE-2000 Series Encoders are easily wired into camera control units, or a remote control module, Model RC-2000EN, is available for mounting in an RP-203 Rack Frame.



## Specifications

### VIDEO INPUT SIGNAL:

RGB or RGBM Video  
Level: 0.714 Volt Peak-to-Peak  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB to 5.5 MHz  
Isolation: Greater than 46 dB to 5.5 MHz between RGBY inputs

### PULSE INPUTS:

Sync  
Blanking  
Burst Flag (Optional — Internal Burst Flag Generator Standard)  
Level: 2 to 8 Volts Peak-to-Peak, Negative  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB

### SUBCARRIER INPUT:

3.58 MHz Subcarrier  
Level: 1 to 4 Volts Peak-to-Peak  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB

### PROGRAM OUTPUT NO. 1 (STRAPPABLE):

Composite: 1.0 Volt Peak-to-Peak, Nominal  
Non-Composite: 0.714 Volt Peak-to-Peak, Nominal  
Impedance: 75 Ohms,  $\pm 1\%$  Source Terminated  
Return Loss: Greater than 40 dB to 4.2 MHz  
Output Isolation: Greater than 40 dB to 10 MHz

### PROGRAM OUTPUT NO. 2 (STRAPPABLE):

Same as No. 1 except strappable for encoded or mono-only output

### OUTPUT TIMING:

Relative Timing of I, Q, and Y is within 25 nsec. Measured with a 2T Window  
Sync blanking and burst flag timing (with 100 ns Rise Time pulse)  
"Zero delay" mode: Less than 25 ns input to output  
With pulse delay option, adjustable 200 ns to 2  $\mu$ s.

### VIDEO PROPAGATION DELAY:

900  $\pm$  50 nsec. (Inputs to Outputs)

### OUTPUT BURST PHASE STABILITY:

180°  $\pm$  0.5° from B-Y Signal. Leads I by 57°,  $\pm$  0.2°

### OUTPUT BURST WIDTH:

Internal: Adjustable 6-10 cycles  
External: Dependant on Burst Flag Input

### CARRIER UNBALANCE:

$\geq$  50 dB, 55-60 dB typical

### QUADRATURE:

90°  $\pm$  0.25°

### PAL SWITCHING:

### DC ON OUTPUTS:

Blanking level @ 0V  $\pm$  50 mV, 10-90% APL. (Factory Adjust)

### OUTPUT BURST AMPLITUDE:

40,  $\pm$  2 IEEE Units (Adjustable)

### OUTPUT BURST POSITION:

Internal: 400-1000 ns Adjustable  
External: Per external input except variable with Pulse Delay Module installed

### LUMINANCE (Y) VIDEO: (RGB Mode — Without Aperture Correction or Notch Filter)

Matricing: Y=30%R + 59%G + 11%B. All ratios within 1.5%  
Frequency Response:  $\pm$  0.5 dB to 5.5 MHz;  $\leq$  3 dB to 10 MHz  
Transient Response: Less than or equal to 1% K Factor for a 1T Pulse (125 nsec. HAD)  
Tilt (Line & Field): Less than 1%  
Overshoot, Ringing & Bounce: Less than 1% Overall  
Differential Gain: Less than 0.5% 10-90% APL  
Hum & Noise: Greater than 60 dB Down from Reference White  
3.58 MHz Notch Filter: Attenuates Subcarrier 6 dB

## TCE-2000P PAL Encoder

RGB or RGBM Video  
Level: 0.7 Volt Peak-to-Peak  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB to 5.5 MHz  
Isolation: Greater than 46 dB to 5.5 MHz between RGBY inputs

Sync  
Blanking  
Burst Flag (*No PAL-ID Pulse Required*)  
Level: 1 to 4 Volts Peak-to-Peak, Negative  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB

4.43 MHz Subcarrier  
Level: 1 to 4 Volts Peak-to-Peak  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB

Composite: 1.0 Volt Peak-to-Peak Nominal  
Non-Composite: 0.7 Volt Peak-to-Peak, Nominal  
Impedance: 75 Ohms,  $\pm 1\%$  Source Terminated  
Return Loss: Greater than 40 dB to 5.5 MHz  
Isolation: Greater than 40 dB to 10 MHz

Same as No. 1 except strappable for encoded or mono-only output

Relative Timing of U, V, and Y is within 25 nsec. Measured with a 2T window  
Sync blanking and burst flag timing (with 100 ns Rise Time pulse)  
"Zero delay" mode: Less than 25 ns input to output  
With pulse delay option, adjustable 200 ns to 2  $\mu$ s.

900  $\pm$  50 nsec. (Inputs-to-Outputs)

$\pm$  135°,  $\pm$  0.5° from B-Y Signal

Dependent on Burst Flag Input

$\geq$  50 dB, 55-60 dB typical

90°  $\pm$  0.25°

180°,  $\pm$  0.2°

Blanking level @ 0V  $\pm$  50 mV, 10-90% APL. (Factory Adjust)

0.3,  $\pm$  0.015 Volts Peak-to-Peak (Adjustable)

External strapping: Per external input except variable with Pulse Delay Module installed

Matricing: Y=29.9%R + 58.7%G + 11.4%B. All ratios within 1.5%  
Frequency Response:  $\pm$  0.5 dB to 5.5 MHz;  $\leq$  3 dB to 10 MHz  
Transient Response: Less than or Equal to 1% K Factor for a 1T Pulse (100 nsec. HAD)  
Tilt (Line & Field): Less than 1%  
Overshoot, Ringing & Bounce: Less than 1% Overall  
Differential Gain: Less than 0.5% 10-90% APL  
Hum & Noise: Greater than 60 dB Down from Reference White  
4.43 MHz Notch Filter: Attenuates Subcarrier 6 dB

## TCE-2000M PAL-M Encoder

RGB or RGBM Video  
Level: 0.7 Volt Peak-to-Peak  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB to 5.5 MHz  
Isolation: Greater than 46 dB to 5.5 MHz between RGBY inputs

Sync  
Blanking  
Burst Flag (*No PAL-ID Pulse Required*)  
Level: 2 to 8 Volts Peak-to-Peak, Negative  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB

3.57 MHz Subcarrier  
Level: 1 to 4 Volts Peak-to-Peak  
Impedance: High Impedance, Bridging, Looping Jacks Provided  
Return Loss: Greater than 40 dB

Composite: 1.0 Volt Peak-to-Peak Nominal  
Non-Composite: 0.7 Volt Peak-to-Peak, Nominal  
Impedance: 75 Ohms,  $\pm 1\%$  Source Terminated  
Return Loss: Greater than 40 dB to 4.2 MHz  
Isolation: Greater than 40 dB to 10 MHz

Same as No. 1 except strappable for encoded or mono-only output

Relative Timing of U, V, and Y is within 25 nsec. Measured with a 2T window  
Sync blanking and burst flag timing (with 100 ns Rise Time pulse)  
"Zero delay" mode: Less than 25 ns input to output  
With pulse delay option, adjustable 200 ns to 2  $\mu$ s.

900  $\pm$  50 nsec. (Inputs-to-Outputs)

$\pm$  135°,  $\pm$  0.5° from B-Y Signal

Dependent on Burst Flag Input

$\geq$  50 dB, 55-60 dB typical

90°  $\pm$  0.25°

180°,  $\pm$  0.2°

Blanking level @ 0V  $\pm$  50 mV, 10-90% APL. (Factory Adjust)

0.3,  $\pm$  0.015 Volts Peak-to-Peak (Adjustable)

External strapping: Per external input except variable with Pulse Delay Module installed

Matricing: Y=29.9%R + 58.7%G + 11.4%B. All ratios within 1.5%  
Frequency Response:  $\pm$  0.5 dB to 5.5 MHz;  $\leq$  3 dB to 10 MHz  
Transient Response: Less than or Equal to 1% K Factor for a 1T Pulse (125 nsec. HAD)  
Tilt (Line & Field): Less than 1%  
Overshoot, Ringing & Bounce: Less than 1% Overall  
Differential Gain: Less than 0.5% 10-90% APL  
Hum & Noise: Greater than 60 dB Down from Reference White  
3.57 MHz Notch Filter: Attenuates Subcarrier 6 dB



Specifications

CHROMINANCE VIDEO:

VERTICAL INTERVAL:

OUTPUT SYNC:

APERTURE CORRECTION: (Phaseless Delay-Line Type)

CHROMA GAIN:

COLOR BARS: (Optional)

TEMPERATURE & HUMIDITY:

POWER REQUIREMENTS:

MECHANICAL:

TCE-2000 NTSC Encoder

Matricing: I= .5990R — .2773G — .3217B  
Q= .2130R — .5251G + .3121B  
(All Ratios within 0.5%)  
I & Q Gain Stability: + 1.0%  
I & Q Quadrature: 90° ± 0.25°  
Phase Stability: ± 0.5°  
Frequency Response (Modulator Inputs): I Video: Down less than 2 dB at 1.3 MHz; Down more than 20 dB at 3.6MHz  
Q Video: Down less than 2 dB at 400 KHz; Down less than 6 dB at 500 KHz; Down more than 6 dB at 600 KHz  
Transient Response: I & Q Channels from R, G, and B Inputs to Encoder Outputs on Standard Bar Test Signal, Rise Time T=125 nsec., Overshoot of Less than 2.5% on 1st ½ Cycle and an Undershoot of Less than 1% on 2nd ½ Cycle of overshoot  
Differential Phase (I & Q Channels): 0.2° between Zero and full Chrominance

Burst is not present during nine line Vertical Sync Interval

Rise Times: 125 nsec. Nominal (Symmetrical) Field Strappable

Adjustable up to 10 dB at 3.0 MHz (4.0 MHz, 5.0 MHz available on special order)  
Threshold Adjustable — Any Value between Setup and 100 IEEE Units

Remotely Adjustable from Unity to +6 dB

EIA RS-189 Specifications for 75% Amplitude Bars, Strappable to FCC 8-Bar Color Bars with 100% White Reference

Bars Switchable from Full Raster to Split Screen with —I, WHT, +Q Bars on Lower ¼ of Raster

All Specifications are Met or Exceeded Over the Entire Ambient Temperature Range of 0° to 60° C (32° to 140° F) with Humidity to 95%

100-130 (200-260) @ 58-62 Hz

210-260 (105-130) @ 48-52 Hz

Dimensions: 1¾" High x 19" Wide X 17" Deep  
Weight: 17½ lbs. Shipping Weight: 19½ lbs.  
Connectors: Pulse & Video — Type BNC; Remote — Amphenol 15-Pin Female

TCE-2000P PAL Encoder

Matricing: U= —.1474R — .2894G + .4368B  
V= .6148R — .5148G — .1000B  
(All Ratios within 0.5%)  
U & V Gain Stability: ± 1.0%  
U & V Quadrature: 90° ± 0.2° (±0.3° Alternate Phase)  
Phase Stability: ± 0.5°  
Frequency Response (Modulator Inputs): U & V Video: Down less than 3 dB at 1.3 MHz; Down more than 20 dB at 4.0 MHz

Transient Response: U & V Channels from R, G, and B Inputs to Encoder Outputs on Standard Bar Test Signal, Rise Time T=100 nsec., Overshoot of Less than 2.5% on 1st ½ Cycle, and an Undershoot of Less than 1% on 2nd ½ Cycle of overshoot  
Differential Phase (U & V Channels): 0.2° between Zero and full Chrominance  
TCE-2000P — U & V filters have PAL-I bandwidths  
TCE-2000PB — U & V filters have PAL-B, G, H bandwidths

Burst is not present during nine line Vertical Sync Interval through full four field PAL sequence

Rise Times: 125 nsec. Nominal (Symmetrical) Field Strappable

Adjustable up to 10 dB at 3.0 MHz (4.0 MHz, 5.0 MHz available on special order)  
Threshold Adjustable — Any Value to 100 IEEE Units

Remotely Adjustable from Unity to +6 dB

Factory Set for EBU Bars with 75% Amplitude, 100% Saturation, 100% White Reference. Strappable to:  
100% Bars — 100% Amplitude, 100% Saturation, 100% White Reference  
BBC Bars — 100% Amplitude, 95% Saturation, 100% White Reference

Bars Switchable from Full Raster to Split Screen with —V, WHT, —U Bars on Lower ¼ of Raster

All Specifications are Met or Exceeded Over the Entire Ambient Temperature Range of 0° to 60° C (32° to 140° F) with Humidity to 95%

100-130 (200-260) @ 58-62 Hz

210-260 (105-130) @ 48-52 Hz

Dimensions: 4.45 cm High x 48.26 cm Wide x 43.18 cm Deep  
Weight: 7.93 kg. Shipping Weight: 8.85 kg  
Connectors: Pulse & Video — Type BNC; Remote — Amphenol 15-Pin Female

TCE-2000M PAL-M Encoder

Matricing: U= —.1474R — .2894G + .4368B  
V= .6148R — .5148G — .1000B  
(All Ratios within 0.5%)  
U & V Gain Stability: ± 1.0%  
U & V Quadrature: 90° ± 0.2° (±0.3° Alternate Phase)  
Phase Stability: ± 0.5°  
Frequency Response (Modulator Inputs): U & V Video: Down less than 3 dB at 1.3 MHz; Down more than 20 dB at 4.0 MHz

Transient Response: U & V Channels from R, G, and B Inputs to Encoder Outputs on Standard Bar Test Signal, Rise Time T=100 nsec., Overshoot of Less than 2.5% on 1st ½ Cycle, and an Undershoot of Less than 1% of 2nd ½ Cycle of overshoot  
Differential Phase (U & V Channels): 0.2° between Zero and full Chrominance

Burst is not present during eleven line Vertical Sync Interval through full four field PAL sequence

Rise Times: 125 nsec. Nominal (Symmetrical) Field Strappable

Adjustable up to 10 dB at 3.0 MHz (4.0 MHz, 5.0 MHz available on special order)  
Threshold Adjustable — Any Value to 1000 IEEE Units

Remotely Adjustable from Unity to +6 dB

Factory Set for EBU Bars with 75% Amplitude, 100% Saturation, 100% White Reference. Strappable to:  
100% Bars — 100% Amplitude, 100% Saturation, 100% White Reference  
BBC Bars — 100% Amplitude, 95% Saturation, 100% White Reference

Bars Switchable from Full Raster to Split Screen with —V, WHT, —U Bars on Lower ¼ of Raster

All Specifications are Met or Exceeded Over the Entire Ambient Temperature Range of 0° to 60° C (32° to 140° F) with Humidity to 95%

100-130 (200-260) @ 58-62 Hz

210-260 (105-130) @ 48-52 Hz

Dimensions: 4.45 cm High x 48.26 cm Wide x 43.18 cm Deep  
Weight: 7.63 kg. Shipping Weight: 8.85 kg.  
Connectors: Pulse & Video — Type BNC; Remote — Amphenol 15-Pin Female



## Ordering Information

### Encoders:

TCE-2000N Digital NTSC Color Encoder  
TCE-2000P Digital PAL Color Encoder (for PAL-I)  
TCE-2000P-I Digital PAL Color Encoder (for PAL  
B, G, & H)  
TCE-2000M Digital PAL-M Color Encoder

### Accessories

PD-2000 Pulse Delay Module  
BG-2000 Color Bar Generator  
RC-2000EN Remote Control Module  
RP-203 Rack Panel. Accommodates up to  
three Remote Control Modules  
CC-3000EN Interconnecting Cable — Interconnects  
RC-2000EN and TCE-2000 Series  
Encoders (Specify Length)



**TELEMATION, INC.**

P. O. BOX 15068, SALT LAKE CITY, UTAH 84115, (801) 487-5399

TELEX: 388-352



# Bencher® M/M

• The vertical camera stand system





# Bencher M/M Camera Stand

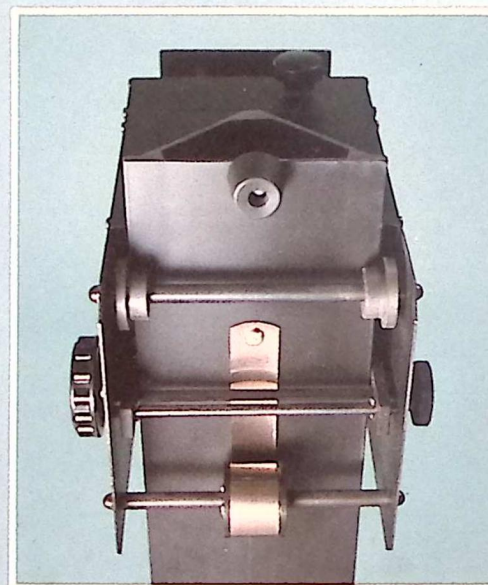
Whether you need a stand for macro photography, creative graphics, or copying opaque materials, here is the ideal tool. Suitable for most cameras to 4"x5", it is backed by the most complete selection of accessories available to create a system ideal for your needs.

## Column

Precision, extruded, black anodized 48" column for full reproduction range. Triangular girder provides superb rigidity.

## Camera carriage

Carriage has three-point suspension on Nylotron rollers for precise tracking and smooth travel. Camera bracket moves in and out 4" for camera centering. Constant tension spring provides linear counterbalancing throughout range. Unique dual brakes offer positive locking of the camera carriage without the usual lateral shift.



## Baseboard

Heavy, 1" thick, high-density composition baseboard has steel reinforcement for maximum rigidity. Laminated wood-grain vinyl overlay provides attractive, easily cleaned surface.

## Recommended accessories

Stationary Light Support Arms  
Strobe Copy Light  
Quartz Copy Lights  
Incandescent Light Assembly  
Movable Copy Stage  
Swivel Light Support Arms  
Slide Duplicator  
Camera Stand Bench  
Copy Holddown  
Camera Quick Release  
Polarizing Light Filter Kit  
Illuminator Base Assembly  
Wall Mounting Brackets  
Special counterbalance springs  
(for heavy cameras)

Note: Cameras not included in systems

# Bencher M/M Outfit

Expressly designed to handle the tough multimedia jobs, the M/M Outfit includes the basic equipment needed for making slides or copies of transparencies and overlays as well as opaque artwork or three-dimensional objects with your camera. Built around the Bencher M/M Camera Stand, the M/M Outfit also includes:

## Movable Copy Stage

Unique counterbalanced Movable Copy Stage with translucent opal Plexiglas insert can be raised or lowered for maximum convenience and speed in composing and focusing. The Swivel Light Support Arms (included) permit both top and back lighting of small objects, gross specimens, or transparencies to 14"x17". Stage is easily detachable.

## Choice of light sources

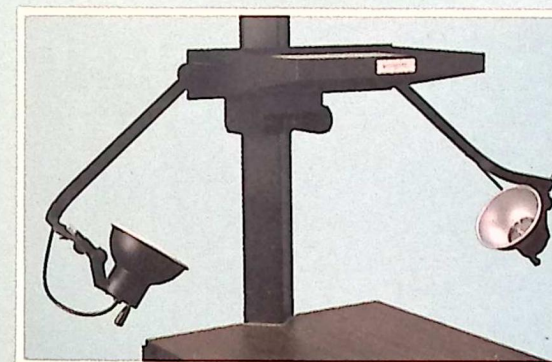
Three different light sources are available as components of the M/M Outfit to meet every need.

**Strobe** Ideal for brilliant color photography using daylight-balanced films or where heat is undesirable.

**Quartz** The choice where continuous color-balanced lighting is required for color or black & white photography.

**Incandescent** The economical option for black & white photography.

Movable Copy Stage with lights adjusted for back lighting through translucent opal Plexiglas insert.



## Camera Stand Bench (Optional)

The M/M Outfit is shown mounted on the Camera Stand Bench (optional) with the Quartz Light Control (optional).

## Recommended accessories

Camera Stand Bench  
Copy Holddown  
Camera Quick Release  
Polarizing Light Filter Kit  
Slide Duplicator  
Copy Mask Set  
Wall Mounting Brackets  
Special counterbalance springs  
(for heavy cameras)





# Bencher M/M Illuma System

The system for the tough jobs. Offering all the features of the Bencher M/M Camera Stand, the Illuma incorporates added flexibility with the new 14"x17"-format base illuminator. The illuminator features precision color balance, choice of strobe or quartz, and exceptionally even lighting.

**For creative graphics** Where slide making and visuals are the name of the game. The Illuma System is unexcelled, with its offerings of both transmitted and reflected light which can be used singly or in concert. With the base illuminator, the full range of the column is available. Transparencies, overlays, duplicating artwork, copying—all easy jobs for the Illuma.

**For scientific and technical work** The features that make the Illuma ideal for the creative worker also make the Illuma perfect for analytic, technical, scientific or medical photography. The base illuminator emphasizes edge detail and can be filtered for colored backgrounds. The heavy plate glass over the illuminator aperture accepts the heaviest gross specimen trays. Ruggedness of construction, evenness of illumination, and heat control to protect delicate specimens combine to make the Illuma the system of choice where critical results are required.

## Illuminated baseboard assembly

A 20"x26" usable baseboard with 14"x17" lighted aperture for extremely even illumination over 13"x16".

## Choice of light sources

**Quartz** Where continuous light required. Two 600-watt side lights and light-support arms included as well as forced-air-cooled 600-watt base illuminator—all at 3200°K. Intensity levels of both side lights and base illuminator are controlled individually from the front panel.

**Strobe** Where heat must be minimized or where daylight film is desired. 100 watt-seconds of power offer a normal exposure at f/11, using ASA 64 films. Side lights and base illuminator are controlled by front-panel switches.

## Recommended accessories

Camera Quick Release  
Polarizing Light Filter Kit  
Copy Mask Set  
Slide Duplicator  
Special counterbalance springs  
(for heavy cameras)

## RCO (Radiographic Copy Outfit)

Designed for fast, easy copying of radiographs 14"x17" or smaller to produce high-quality, projection-ready, 35mm slides in minutes.

The RCO is designed to take full advantage of Kodak SO-185 and similar material. This high-resolution, continuous-tone 35mm film processes into a 35mm slide automatically through conventional radiographic processors without adjustment.

Careful attention to user requirements makes the unit easy to operate; any person competent with a 35mm camera can operate the RCO.

Because SO-185 has an extremely low ASA rating, the RCO incorporates a precision auto-reset shutter-range extender system that times camera shutter speeds to 60 seconds. This remotely controlled feature includes a special air-cushioned camera-actuating mechanism with full adjustments of stroke depth to protect the most sensitive shutters and is fully adaptable to virtually any camera.

The extremely even light coverage of the base illuminator ensures faithful reproduction of the most subtle density variations in radiographs. A radiographic masking set is also included for copying standard radiographs smaller than 14"x17".

## Instant multimedia center

In addition, the RCO retains all the features of the Bencher M/M Illuma Quartz Outfit, as shown on the facing page, becoming an instant multimedia center. With the quartz side lights, charts and graphics can be made still using SO-185, so that a complete slide presentation can be produced start to finish in a morning.

Or, if conventional color slides are required, the system is fully compatible with and color-balanced for Type B films. With the addition of the optional Polarizing Light Filter Kit, the RCO becomes an outstanding tool for the gross-specimen photography as well.

## Recommended accessories

Camera Quick Release  
Polarizing Light Filter Kit  
Slide Duplicator

# Bencher RCO System





# Bencher accessories

## a Wall Mounting Brackets (130-62)

Adapts any M/M Camera Stand to wall-mounted unit. Ideal for conserving space. Includes top and bottom brackets with hardware.

## b Movable Copy Stage (130-60)

Adapts M/M Camera Stand into M/M Outfit when Swivel Light Support Arms and lights are added. Includes stage, translucent opal Plexiglas insert, and movable, counterbalanced carriage. Lights and arms not included (See also page 3).

## c Stationary Light Support Arms (130-50)

These arms fit into brackets on all M/M baseboards and hold the lights 36" out from center of the baseboard. Standard  $\frac{3}{8}$ " stud posts accept all Bencher lights as well as most others.

## d Polarizing Light Filter Kit (130-66)

Designed to polarize Bencher strobe or quartz light sources when mounted on Stationary Light Support Arms. Reduces flare and reflection on subject material. Must be used with camera polarizing filter (not supplied). When used with quartz lighting, it should be used only in conjunction with Quartz Light Control.

The hallmark of the Bencher M/M System is the complete range of optional accessories that increase the scope and versatility of the system.

## Choice of three light sources

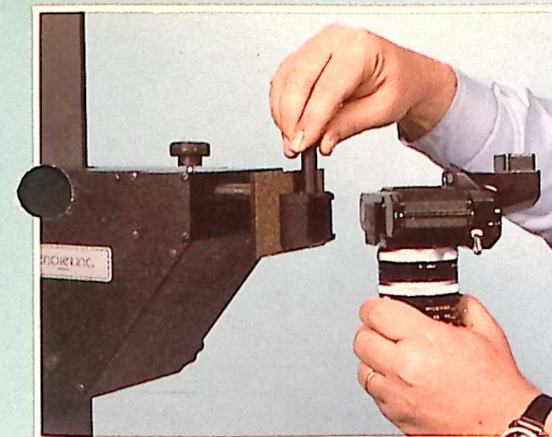
**Strobe (130-54)** The ideal lighting—cool, daylight-balanced, superb for any application. 100 watt-second power rating. Typical exposure allows f/11 with ASA 64 films. New, specially designed reflector provides extremely even illumination over the baseboard.

**Quartz (130-52)** The choice where continuous light is required. Balanced for 3200°K color films; color balance does not drift as bulb ages; 600 watts per lamp (1200 watts total) assures plenty of light for any requirement.

**Incandescent (130-53)** Lowest in cost, incandescent is suitable for most black & white photography; 250 watts per lamp (500 watts total).

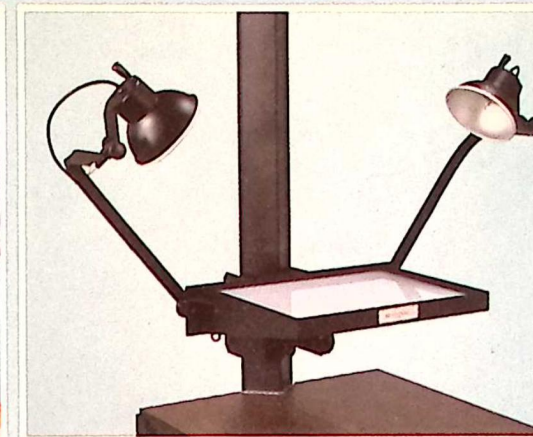
## Base Illuminator (130-56)

The new Base Illuminator of the Bencher Illuma System is also offered as an accessory unit to retrofit earlier M/M Stands and or Benches. In most cases, it will be necessary to drill one to three holes in existing units, but no other modification will be required. Quartz Light Control or strobe power supply included with Base Illuminator. Side lights optional.



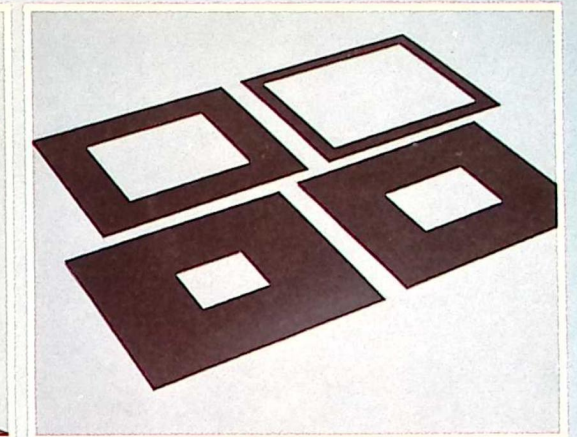
## Camera Quick Release (130-61)

A precision quick release that allows the user to easily and quickly remove camera, reload film, and return to the identical camera position so that the camera need not be realigned.



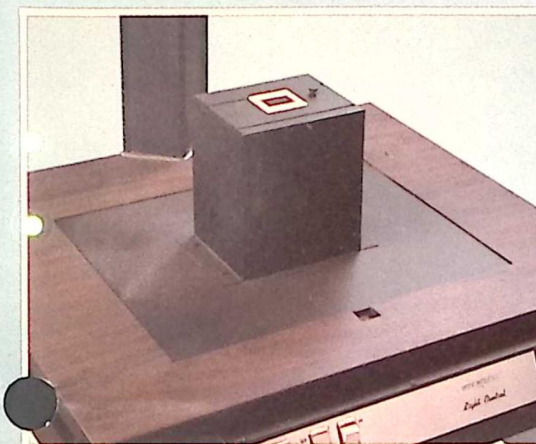
## Swivel Light Support Arms (130-51)

Used only with Movable Copy Stage. Permits lighting above or below opal Plexiglas of stage. Standard  $\frac{3}{8}$ " mounting stud accepts virtually any light.



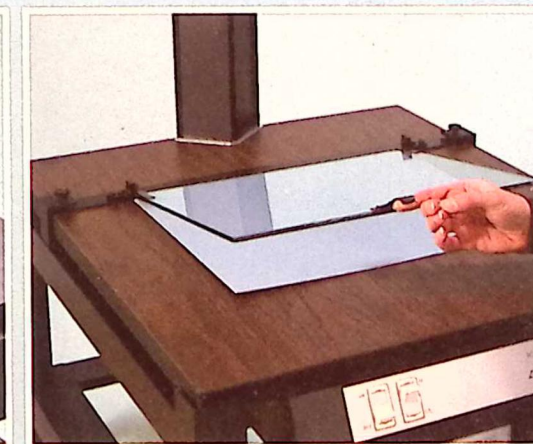
## Copy Mask Set (130-63)

Set of four masks 14"x17" overall outside, with apertures of 11"x14", 8"x10", 5"x7", and 4"x5". Used with Movable Copy Stage or Base Illuminator to reduce stray light.



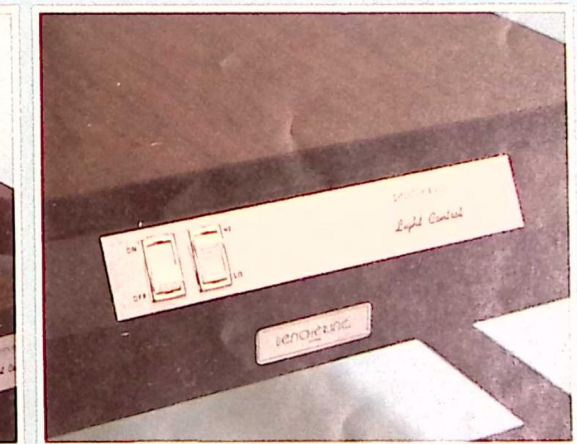
## Slide Duplicator (130-64)

Used with Base Illuminator or Movable Copy Stage for standard 35mm mounted slides. Adjustable index stop, and filter drawer for correction filters if needed. Carefully designed for even illumination. Can be used with strobe or quartz.



## Copy Holdown (130-67)

For flat materials to 11"x14". Heavy plate glass flattens material and holds it in place. Hinged riser accepts material to  $\frac{3}{16}$ " thick. Camera mask included.



## Quartz Light Control (130-55)

Designed for both quartz and incandescent lights. Reduces light output during focusing and composition. Control has off/on, high/low switches. Solid state circuitry reduces heat, conserves energy, extends bulb life.



## Camera Stand Bench (130-65)

Sturdy, black, painted steel frame holds camera stand at convenient working height. Accepts Quartz Light Control or strobe power supply.



# Bencher M/M specifications



M/M Camera Stand



M/M Outfit



Illuma System



RCO Radiographic Copy Outfit

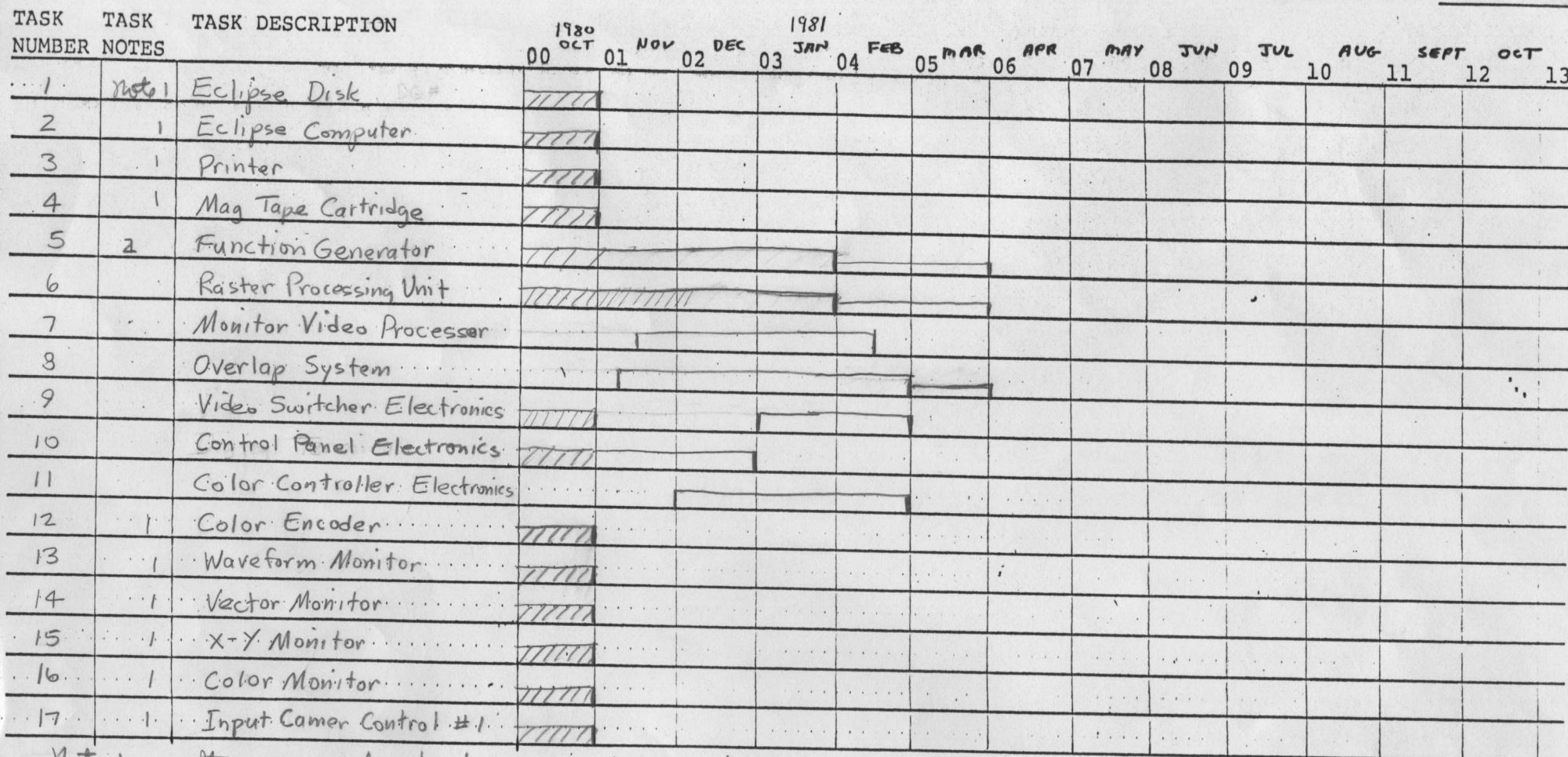
Design and photography David Doty

|                                                | M/M Camera Stand | M/M Outfit   | Illuma System | RCO<br>Radiographic<br>Copy Outfit |
|------------------------------------------------|------------------|--------------|---------------|------------------------------------|
| Column height                                  | 48"              | 48"          | 48"           | 48"                                |
| Height to camera screw<br>from baseboard       | 46¼"             | 46¼"         | 46¼"          | 46¼"                               |
| Baseboard size                                 | 26½"x23½"        | 26½"x23½"    | 26½"x23½"     | 26½"x23½"                          |
| Usable baseboard area                          | 23½"x24"         | 23½"x24"     | 26½"x21"      | 26½"x21"                           |
| Camera travel, in front                        | 4"               | 4"           | 4"            | 4"                                 |
| Counterbalanced weight                         |                  |              |               |                                    |
| Standard spring                                | Up to 5 lbs.     | Up to 5 lbs. | Up to 5 lbs.  | Up to 5 lbs.                       |
| Heavy spring                                   | Up to 7 lbs.     | Up to 7 lbs. | Up to 7 lbs.  | Up to 7 lbs.                       |
| Overall height                                 | 50"              | 50"          | 66½"          | 66½"                               |
| Maximum width (long arms)                      | 66"              | 66"          | 66"           | 66"                                |
| Approx. net weight*                            | 35 lbs.          | 47 lbs.      | 68 lbs.       | 71 lbs.                            |
| Power requirements,<br>max. 60Hz, 120 volts AC |                  |              |               |                                    |
| Incandescent                                   | 5A               | 5A           | 5A            | 5A                                 |
| Quartz                                         | 10A              | 10A          | 15A           | 15A                                |
| Strobe                                         | 2A               | 2A           | 2A            | 2A                                 |

\*Depends on lighting system where included.

Bencher<sup>®</sup>, Inc.  
333 W. Lake Street  
Chicago, Illinois 60606  
312 263-1808





Note 1 Items are purchased and used with slight modification.

Note 2 → second level of effort indicates testing and modification



PROJECT: Prototype System IV

## MILESTONE CHART

DATE: \_\_\_\_\_

SHEET 2 OF 2

PREPARED BY: \_\_\_\_\_

[illegible]

2 Still need to put casters on camera stands

PROJECT: \_\_\_\_\_

## MILESTONE CHART

DATE: \_\_\_\_\_

SHEET 1 OF 2

PREPARED BY: \_\_\_\_\_

TASK TASK TASK DESCRIPTION

NUMBER NOTES

|    |         |                              | 00   | 01   | 02  | 03  | 04  | 05  | 06  | 07  | 08  | 09  | 10  | 11   | 12  | 13 |
|----|---------|------------------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|----|
|    |         |                              | 1980 | 1981 |     |     |     |     |     |     |     |     |     |      |     |    |
|    |         |                              | OCT  | NOV  | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEPT | OCT |    |
| 1  | Note #1 | Eclipse Disk                 |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 2  | #1      | Eclipse Computer             |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 3  | #1      | Printer                      |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 4  |         | Mag Tape Cartridge           |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 5  |         | Function Generator           |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 6  |         | Raster Processing Unit       |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 7  |         | Monitor Video Processor      |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 8  |         | Overlap System               |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 9  |         | Video Switcher Electronics   |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 10 |         | Control Panel Electronics    |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
|    |         | Digital Terminal             |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 11 |         | Color Controller Electronics |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 12 | #1      | Color Encoder                |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 13 | #1      | Waveform Monitor             |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 14 | #1      | Vector Monitor               |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 15 | #1      | X-Y Monitor                  |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 16 | #1      | Color Monitor                |      |      |     |     |     |     |     |     |     |     |     |      |     |    |
| 17 | #1      | Input Camer Control #1       |      |      |     |     |     |     |     |     |     |     |     |      |     |    |

Note #1 - This item is purchased and used without extensive labor



PROJECT: \_\_\_\_\_

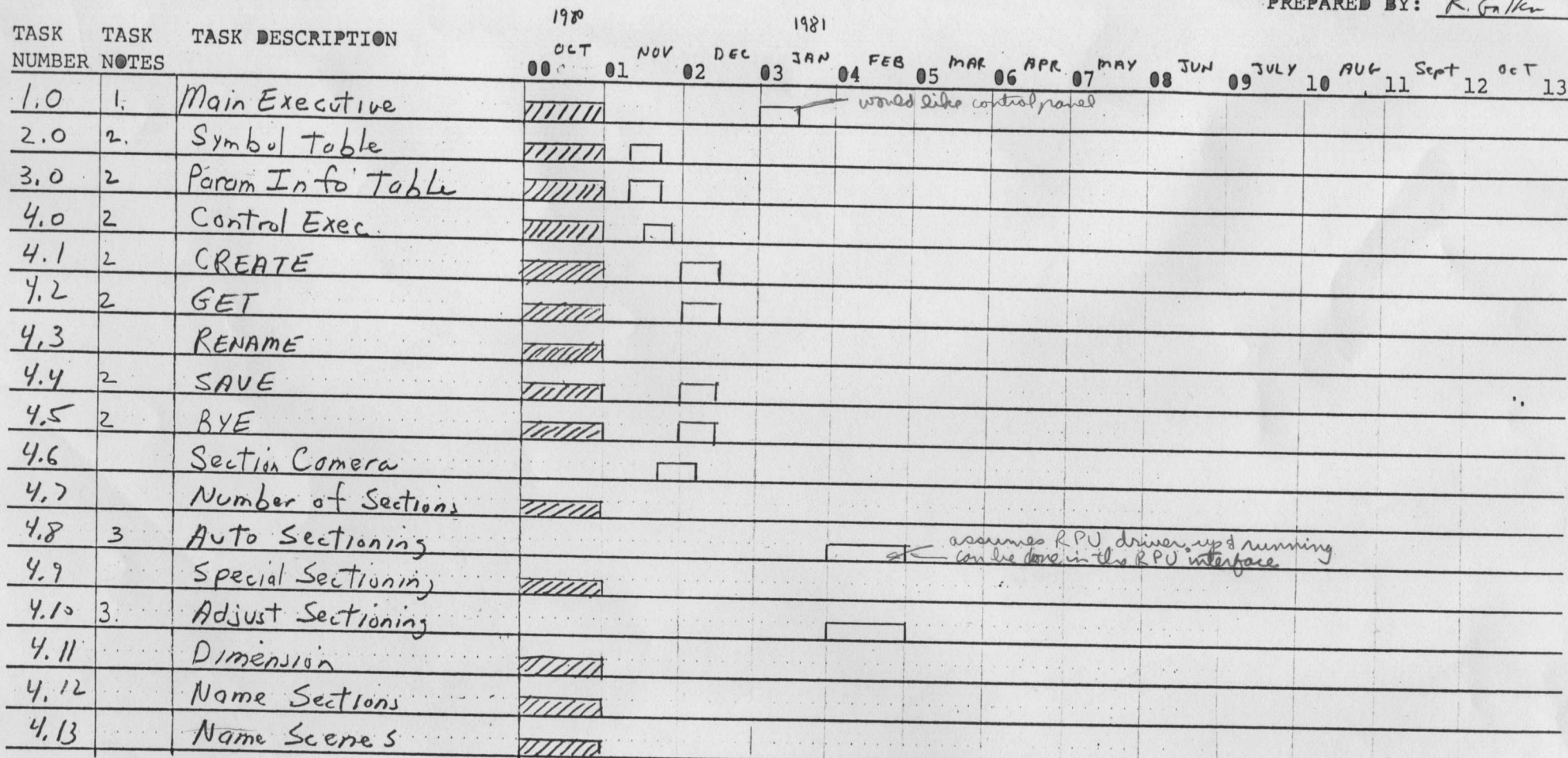
DATE: \_\_\_\_\_

PREPARED BY: \_\_\_\_\_

Note #1 - This item is purchased and used without extensive labor

PROJECT: System 4 Software

## MILESTONE CHART

DATE: 2 Nov 80SHEET 1 OF 3PREPARED BY: R. Galka

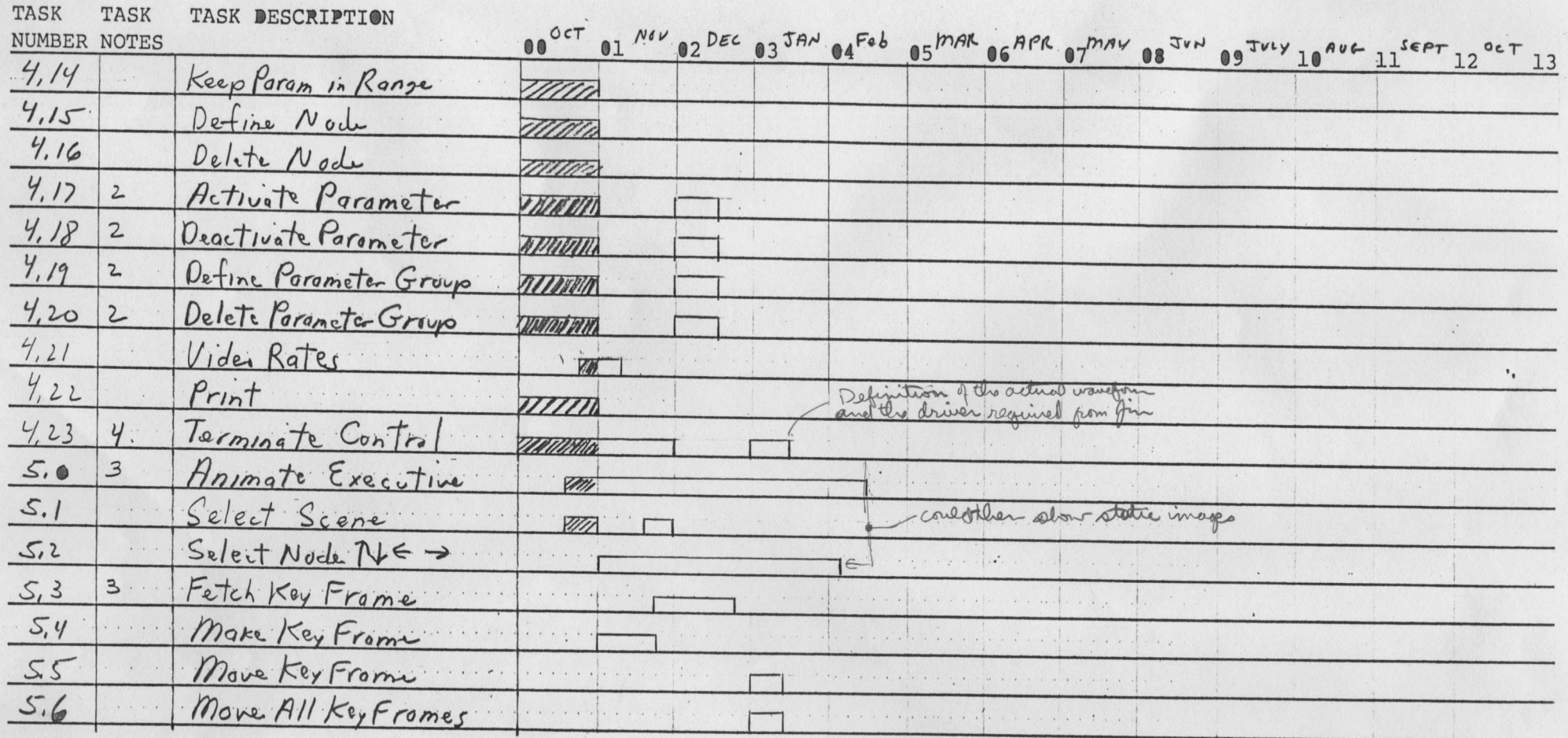
1. Add poller and Lamp pgms when hardware defined. Also modifier \$TTO program because of hardware changes
2. Needs modification because of hardware changes
3. Hardware not defined yet - Debugging with stubs & special sectioning

Gordon Morrison  
NOAA - work place



PROJECT: Sy 4 Software

## MILESTONE CHART

DATE: 2 Nov 80SHEET 2 OF 3PREPARED BY: K.G. Ik

4. Load oscillator wave forms.

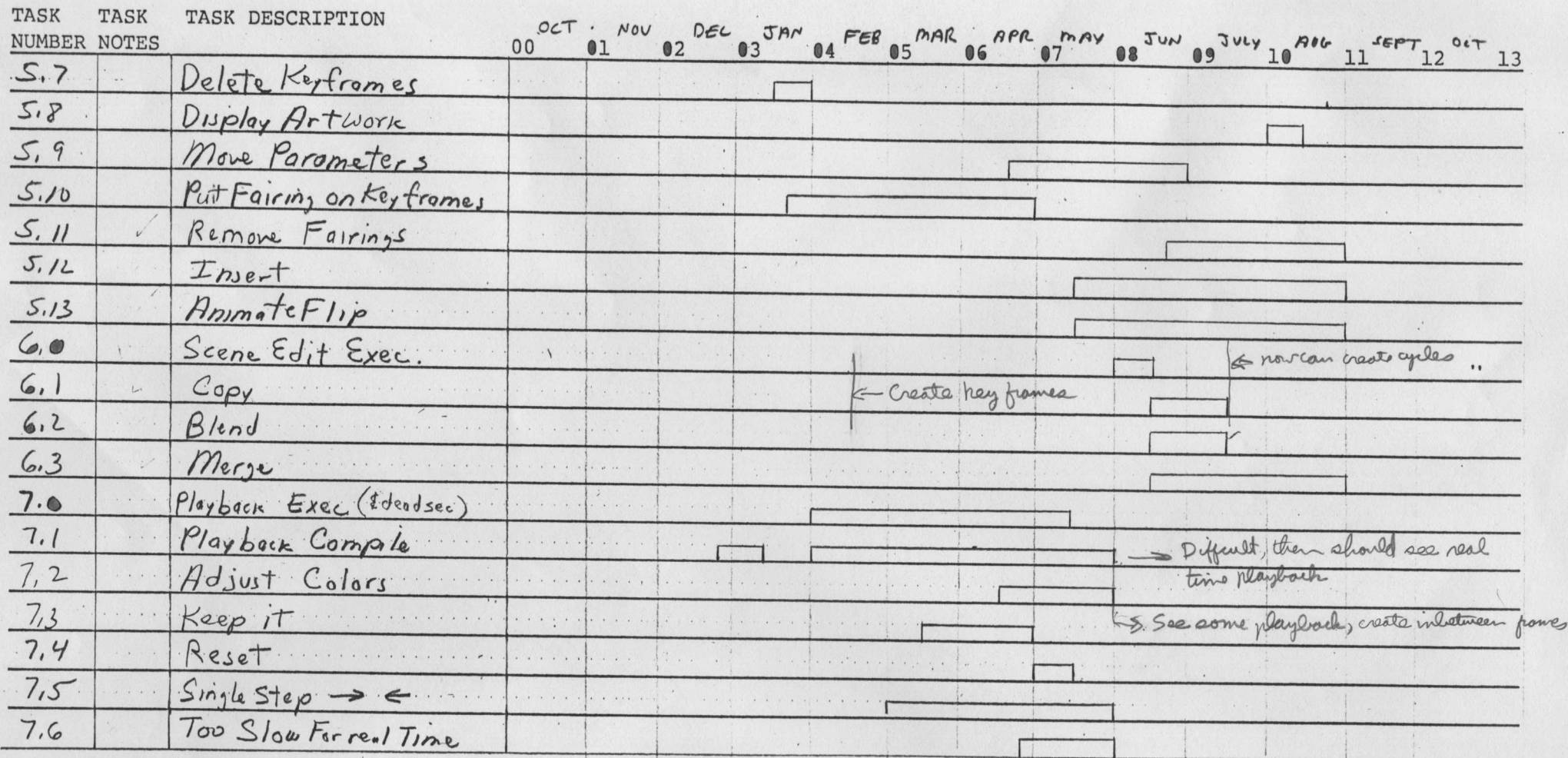
PROJECT: Sy 4 Software

## MILESTONE CHART

DATE: 2N 00

SHEET 3 OF 3

PREPARED BY: R. Calk





| TASK   |       | TASK DESCRIPTION   | 1980   |        |        |        |        |        |        |        |        |        |         |        |         | 1981   |  |  |  |  |  |  |  |  |  |  |  |  |
|--------|-------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|---------|--------|--|--|--|--|--|--|--|--|--|--|--|--|
| NUMBER | NOTES |                    | OCT 00 | OCT 01 | NOV 02 | DEC 03 | JAN 04 | FEB 05 | MAR 06 | APR 07 | MAY 08 | JUN 09 | JULY 10 | AUG 11 | Sept 12 | OCT 13 |  |  |  |  |  |  |  |  |  |  |  |  |
| 1.0    | 1     | Main Executive     | ██████ |        |        | ██████ |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 2.0    | 2,5   | Symbol Table       | ██████ | ██████ |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 3.0    | 25    | Param Info Table   | ██████ | ██████ |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.0    | 2     | Control Exec.      | ██████ | ██████ |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.1    | 2     | CREATE             | ██████ |        | ██████ |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.2    | 2     | GET                | ██████ |        | ██████ |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.3    |       | RENAME             | ██████ |        |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.4    | 2     | SAVE               | ██████ |        | ██████ |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.5    | 2     | RYE                | ██████ |        | ██████ |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.6    |       | Section Camera     |        |        | ██████ |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.7    |       | Number of Sections | ██████ |        |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.8    | 3     | Auto Sectioning    |        |        |        |        |        |        | ██████ |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.9    |       | Special Sectioning | ██████ |        |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.10   | 3     | Adjust Sectioning  |        |        |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.11   |       | Dimension          | ██████ |        |        |        |        |        | ██████ |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.12   |       | Name Sections      | ██████ |        |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.13   |       | Name Scenes        | ██████ |        |        |        |        |        |        |        |        |        |         |        |         |        |  |  |  |  |  |  |  |  |  |  |  |  |

1. Add poller and Lamp pgms when hardware defined. Also modifier \$TTO program because of hardware changes
2. Needs modification because of hardware changes
3. Hardware not defined yet - Debugging with stubs & special sectioning
- 5 Table changed again

TASK TASK TASK DESCRIPTION  
NUMBER NOTES

00 OCT 01 NOV 02 DEC 03 JAN 04 Feb 05 MAR 06 APR 07 MAY 08 JUN 09 JULY 10 AUG 11 SEPT 12 OCT 13

|      |   |                                        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|------|---|----------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 4.14 |   | Keep Param in Range                    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.15 |   | Define Node                            |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.16 |   | Delete Node                            |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.17 | 2 | Activate Parameter                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.18 | 2 | Deactivate Parameter                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.19 | 2 | Define Parameter Group                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.20 | 2 | Delete Parameter Group                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.21 |   | Video Rates                            |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.22 |   | Print                                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.23 | 4 | Terminate Control                      |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.0  | 3 | Animate Executive                      |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.1  |   | Select Scene                           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.2  |   | Select Node $N \leftarrow \rightarrow$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.3  | 3 | Fetch Key Frame                        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.4  |   | Make Key Frame                         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.5  |   | Move Key Frame                         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.6  |   | Move All Key Frames                    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

4. Load oscillator wave forms.



| TASK | TASK NOTES | TASK DESCRIPTION         |
|------|------------|--------------------------|
| S.7  |            | Delete Keyframes         |
| S.8  |            | Display Artwork          |
| S.9  |            | Move Parameters          |
| S.10 |            | Put Fairing on Keyframes |
| S.11 | ✓          | Remove Fairings          |
| S.12 |            | Insert                   |
| S.13 |            | Animate Flip             |
| G.0  |            | Scene Edit Exec.         |
| G.1  | ✓          | Copy                     |
| G.2  |            | Blend                    |
| G.3  |            | Merge                    |
| 7.0  |            | Playback Exec (Ideadsec) |
| 7.1  |            | Playback Compile         |
| 7.2  |            | Adjust Colors            |
| 7.3  |            | Keep it                  |
| 7.4  |            | Reset                    |
| 7.5  |            | Single Step → ←          |
| 7.6  |            | Too Slow For real Time   |
| B.0  |            | RPU Driver               |
| C.0  |            | Control Panel Driver     |

PROJECT: \_\_\_\_\_

## MILESTONE CHART

DATE: 11/5/80

SHEET 1 OF 2

PREPARED BY: Jim Wolf

TASK TASK TASK DESCRIPTION  
NUMBER NOTES1980 1981  
OCT 00 01 NOV 02 DEC 03 JAN 04 FEB 05 MAR 06 APR 07 MAY 08 JUN 09 JUL 10 AUG 11 SEPT 12 OCT 13

RPU CONTROL

RPU MIMO.

RPU INTERFACE

BASIC PROGRAM

DIAGNOSTICS

TESTING

MAGTAPE

HARDWARE

PROGRAM

TESTING

CONTROL PANEL

TERMINAL (CABLE)

CONTROL INTERFACE

CONTROL PROGRAM

ANALOGUE

CLAMP

← need drivers &amp; interface complete for test



PREPARED BY:

| TASK NUMBER | TASK NOTES | TASK DESCRIPTION |
|-------------|------------|------------------|
| 00          | 1980 OCT   |                  |
| 01          | NOV        |                  |
| 02          | DEC        |                  |
| 03          | JAN 1981   |                  |
| 04          | FEB        |                  |
| 05          | MAR        |                  |
| 06          | APR        |                  |
| 07          | MAY        |                  |
| 08          | JUN        |                  |
| 09          | JUL        |                  |
| 10          | AUG        |                  |
| 11          | SEPT       |                  |
| 12          | OCT        |                  |
| 13          |            |                  |